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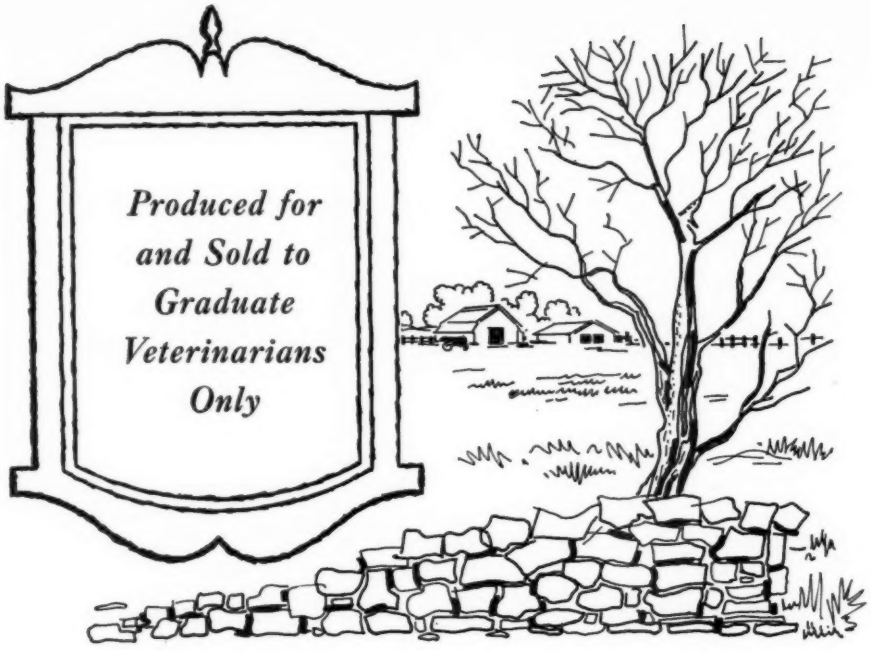

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Veterinary-Feed Industry Relations

JOHN B. HERRICK, D.V.M.
Extension Veterinarian
Iowa State University

This paper was presented at the Third Midwest Veterinary-Nutrition Conference. Dr. Herrick states some of the reasons he believes there have been poor veterinary-feed industry relations and offers recommendations that will benefit both parties.

A great deal has been said in the last few years about veterinary-feed dealer relationships. In some meetings this subject has been stressed, with various suggestions given to both groups as to how this relationship can be one that is workable, pleasant and favorable.

We have observed some relationships in the field that have been in good standing for many years, and in other areas throughout the country relationships that have been far from ideal. The trouble in most cases probably is caused by failures of both parties. Speeches, meetings, editorials and news releases on this subject are good. They sound good and in many cases they are aimed at the welfare of the livestock producer. If the livestock producer does not make money, then neither the veterinarian nor the feed dealer will profit.

Improvement in the veterinarian-feed dealer relationship must start at the grass roots. A great deal can be accomplished at meetings, but if the suggestions and ideas are not practiced in the field, then a lot of time has been wasted at meetings.

If a feed dealer attempts to get into the field of animal health control, he is not equipped to render the service needed by the livestock producer, thus he is invading the field and domain of the veterinary profession. The veterinarian who attempts to get into the feed business by suggesting one feed, condemning feeds or running the industry down is equally at fault.

Many feed companies are selling animal health products. There are many veterinarians who sell animal minerals and feeds. No one is better equipped than the veterinarian to sell feed if he has retained the knowledge of nutrition given in his

course of veterinary medicine. The majority of veterinarians, however, feel that they have all that they can do in their practice of veterinary medicine and should not be involved in selling feeds. Some feed companies are setting up franchises with veterinarians to sell their feed. There is a danger here that the veterinarian will be biased. This will not aid in promoting a better relationship.

Another problem that constantly occurs in the field is that the upper echelon in the feed companies are for development of a good relationship but the man out on the firing line, the salesman, may not be. In many cases he is not trained in nutrition, has failed or has graduated from another job into a feed salesman. This is the fellow who goes out and attempts to sell feed and in attempting to do so, gets into other fields, frequently the field of veterinary medicine. These are the "windshield veterinarians." They make the diagnosis of disease and other disorders across the fence, then attempt to sell feed for the correction of these conditions. A situation like this is the source of much trouble, particularly when the veterinarian is called out to make a correct diagnosis and to institute proper treatment. He is never going to recommend this man or his feed.

A Field Problem

Another source of trouble between the veterinary profession and feed companies is created by the feed salesman who develops a relationship with only one veterinarian in the area. When he recommends this veterinarian to his customers, who have been clients of another, and they call their veterinarian and tell who the feed salesman recommended, this company will not have established a good relationship with some of the veterinary profession.

At meetings, the best that can be done is to make practical suggestions. If top management in the feed industry does not firmly instill in their salesmen and their sales supervisors that there must be good relations with the veterinary profession, how can veterinarians ever work together with the feed industry?

It is difficult to realize how a feed company can stand up at a meeting and proclaim to the world that "together we are going to help the world make money," when down where their feed is being sold, animal health products and "windshield diagnosis" are being sold by their salesmen. We attempt to make a mountain out of a molehill at meetings when actually the mountain is out in the field and the molehill is at the meeting.

Antibiotic Binge

Recently we have gone through an "antibiotic binge." Antibiotics were prescribed and sold for nearly every type of disorder. They were all too often used as a substitute for good management. Antibiotics are good products if properly used. They have done a tremendous amount of good for the livestock industry. On the other hand, the promiscuous use of these drugs has created many problems. We have antibiotic resistant organisms and some that will not respond to any antibiotic therapy. The entire food industry is quite concerned with the problem of food adulteration. We have the problem of antibiotics in milk from the promiscuous use of them to try to control mastitis. Also, the misuse of pesticides and herbicides has reached the point where those who look after the welfare of the food industry now have a concerted program to prevent adulteration of our food.

The feed industry and the veterinary profession can work together to assure the consumer that the products we are producing on our farms are not adulterated. They have the problem of seeing that the animals are taken off various drugs and chemicals the proper length of time before they are sold. As a team, they could better police the activities of the livestock producer so that he will not get into trouble.

The nutritionist and the veterinarian

see nutritional requirements under different circumstances. The nutritionist formulates a ration that contains all of the necessary nutrients for animals under normal conditions. On the other hand, seldom does the veterinarian see a group of animals unless they are under stress. The veterinarian is constantly working with sick animals and frequently does not see them until they are sick. He must make recommendations for animals that are under stress. Animals under stress from various improper management practices and disease conditions require nutrients in greater amounts than are normally needed to repair the cell damage which has occurred. Also, the animal that is under stress usually will not eat as well as a normal, healthy animal. Its ration must provide nutrients in greater amounts to provide for additional tissue repair yet at a lower intake of feed.

The veterinarian and the feed dealer must work together to produce a feed which will meet the requirements of these animals that are under stress. These requirements will vary from farm to farm. Therefore, these rations are going to have to be formulated for each situation. The veterinarian and the feed dealer must plan with the livestock producer to meet these needs.

Preventive Medicine

Veterinary medicine in the past has been aimed primarily at rescuing the perishing instead of attempting to prevent disease. This has been largely the fault of the livestock producer. He attempted to feed his animals and treat their minor ailments. As a last resort he would call his veterinarian when he was in real trouble. The veterinarian thus would make 15 to 20 calls a day in his practice area, treating sick animals and performing necropsies only to discover a herd problem. Many veterinarians and livestock producers now believe that an economical and efficient animal health program must be planned. In planning this program, the veterinarian, livestock producer and feed dealer must work together. Some of these animal health, disease control programs are on a prearranged fee basis for the veterinarian. The veterinarian and the livestock producer decide what will be necessary to maintain health and prevent disease in a particular livestock enterprise. Vaccination programs are scheduled, management suggestions and feed recommendations are made. With such a prearranged animal health program, the feed industry can work with the livestock producer to plan the nutritional requirements and feeds necessary for this livestock enterprise.

Recommendations

What can be done to improve the relationship between the veterinary profession and the feed industry? The following recommendations should help the livestock producer to raise healthy animals efficiently and improve veterinary-feed dealer relations.

1. Grass roots meetings that have been held in the various states in which the veterinarians and feed dealers get together have been good. However, more than just these grass roots meetings are necessary. After the meeting is over and the steak has been consumed, the feed dealer, feed salesman and the veterinarian must go to their respective areas and start active programs.

2. Management in the feed industry should set up, as many already have, recommendations that are relayed to their district men, sales managers and feed salesmen. A step by step program outlining the recommended procedures for developing a favorable relationship with the veterinarian and the livestock producer must be planned and instituted. In many cases the feed dealer or the feed salesman is not aware of what top management is thinking.

3. If feed companies are going to sell animal health products, they should not be concerned about veterinarians selling feed. As long as there are various medicants, drugs and injectables prescribed, sold and

administered to livestock by people other than veterinarians without a proper diagnosis, there will be an invasion of the feed industry by the veterinarian. Frequently, there are complaints that the veterinarian is not properly trained in the field of nutrition. In some cases this may be true, but it is doubtful if 50% of the salesmen selling feed today are properly trained in nutrition. Many feed salesmen have not been in the field long enough to understand the problems that exist, have not had refresher courses in nutrition and many are not college graduates, if that is necessary.

4. There should be good working relationships between the College of Veterinary Medicine and the Nutrition Departments in the College of Agriculture at our state institutions. Too frequently there are innovations, developments, research suggestions and recommendations given by one group of which the other is not aware. This is a challenge to the top administration in both colleges to develop a better relationship, so that when their students graduate and get out in the field, they will be better able to work together.

5. The feed industry should take a greater interest in laws and regulations governing animal health. There are many violations of animal health regulations which require legislative action to correct. A powerful, but less directly interested group is needed to aid in introducing and getting passage of laws governing animal health. This is an important service that the feed industry can do for the livestock industry.

6. State and regional meetings of the feed industry and veterinarians should be held. The nutritionists in the feed industry should be available to the veterinary profession to discuss problems at their meetings. Many of the feed meetings that are held should have veterinarians on the program. Each group should make their information and knowledge available to the other.

7. Veterinarians and the feed industry should work together in developing animal health programs that will aid in preventing disease. Leaders in the veterinary profession should develop standardized programs that can be recommended to the livestock industry.

8. Regulatory personnel of the veterinary profession should study their disease control regulations carefully. The regulations should be planned to prevent the spread of disease but need not be policed by the practicing veterinarian.

9. The feed industry should attempt to get properly trained feed salesmen. These salesmen should understand feeding and nutrition, but also know that it does not involve diagnosing and treating disease conditions.

10. Feed industry personnel and veterinarians should go home from meetings and get to work.

Erratum

The drawings of the dorsal views of the vinylite casts of ventricular cavities of the ox and sheep on pages 42 and 43 in the January issue were incorrectly labeled. The drawing of the dorsal view of the sheep is on the left on page 43 and that of the ox is on the left on page 42.

Proper Use of Urea Feeding

C. L. NORTON
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Manhattan, Kansas

Urea can be satisfactorily used as a replacement for a small part of the protein in a ruminant's ration. It is better utilized by older ruminants, since it is of less value for fattening than growth and has not given consistently good results in rations for lambs. To be effective, a urea-containing feed needs as high quality ingredients as one made up entirely of natural proteins. Urea utilization is enhanced by an adequate level of phosphorus and starches, rather than sugars such as glucose or sucrose. Studies indicate that more than one non-protein nitrogen compound, such as urea and biruet, are better than urea alone, because the nitrogen becomes available in more even amounts and over a longer period of time.

Probably as much research has been conducted on the use of protein and other nitrogen-containing substances in livestock rations as any other single nutrient. This activity has stemmed not only from the economic importance of this part of the ration, but also because protein is indispensable in itself and because protein affects the utilization of other nutrients.

It is recognized that all animals must have protein for maintenance, growth, and production. Farm grown feeds are frequently deficient in protein that can be properly utilized, unless they are supplemented. For many years farmers have relied upon oilmeals for spiking their rations in protein to make them adequate in meeting the nutritive needs of livestock. In ruminants, the rumen provides suitable conditions for bacteria to utilize complex carbohydrates and simple compounds like urea for the production of protein and other substances necessary for good performance.

As early as 1891, Zuntz, a German nutritionist, suggested that rumen micro-

organisms had a function in the ruminant's utilization of nitrogen. Even though American research workers were not the first to suggest ruminant utilization of non-protein nitrogen, they were the first to put the idea to work in a practical way. The scarcity of protein during World War II intensified interest in the use of urea as a substitute. However, recommendations for the use of urea grew out of research which yielded positive results shortly before World War II.

Much research has involved the utilization of urea. Results have been variable and partly due, of course, to interpretation of the data and to experimental procedures. However, some observations have been substantiated fairly conclusively:

1. The ration with which urea is fed greatly affects the use of urea by rumen bacteria.

2. Urea must be utilized by rumen bacteria for their own growth to be useful to the ruminant.

3. The bacterial protein produced contains all of the essential amino acids known to be needed by the ruminant.

4. Relatively high concentrations of urea are safer in a fattening ration than in a maintenance ration.

5. Urea is more efficiently utilized when self-fed than when hand-fed for long periods.

6. Urea itself has no energy value.

Using Urea

Frequently, urea is used as a replacement for a small part of the protein and in such cases has demonstrated rather satisfactory results. In many instances, feed manufacturers have used urea in their competitive feeds as an economy measure. When feed prices are considered, many times this represents a saving to the producer, providing of course that the quality of other ingredients has not been reduced to the detriment of the feed.

Even though all of the essential nutrients which may be critical in a ration containing urea are not known, the following should be considered in the formulation:

1. As urea supplies no energy, an adequate level of starchy feeds is needed to supply energy. On the basis of nitrogen and energy, 1 lb. of urea and 6 lb. of corn are equivalent to 7 lb. of soybean oil meal.

2. High levels of readily soluble proteins in the ration will lower urea utilization, because bacteria will utilize these in preference to non-protein nitrogen.

3. Sugars, such as glucose and sucrose molasses, are less valuable than starch for urea utilization.

4. An adequate level of phosphorus enhances urea utilization. Other minerals may well play a part in improving the utilization of non-protein nitrogen.

5. Dehydrated alfalfa meal (5% to 10%) may supply unknown protein synthesis factors.

6. Avoid the use of low quality, high fiber feeds. To be effective, a urea-containing feed needs as high quality ingredients as one made up entirely of natural proteins.

Effect of Age: The age of the animal apparently influences the degree to which urea is utilized. Calves at 2 months of age have been able to utilize urea nitrogen, but older calves have given faster growth rates. Less difference in utilization has been shown between urea nitrogen and the nitrogen of natural high-protein feeds for milking cows. Older steers seem to do better on urea than do fattening calves. With sheep, mature ewes utilize urea more efficiently than do growing lambs.

Dairy Cattle: In rations where urea provided from 40% to 70% of the nitrogen required by dairy calves 4 months old and older, gains amounted to only 82% to 88% of those made by heifers fed similarly with an equivalent amount of nitrogen from oil meals. Although other experiments showed little if any difference, it is generally concluded that urea is somewhat inferior to conventional sources of protein for growth. Long-time experiments with cows show there is no significant difference between the nitrogen from urea and that from high-

protein feeds when fed at levels up to 27% of the required nitrogen. In most trials, results with urea have been only slightly, though consistently, inferior to those obtained when vegetable proteins were fed.

Beef Cattle: Beef calves give similar results to those obtained with dairy calves. However, the value of urea for fattening is less definite than that for growth. Older fattening cattle give better results with urea than do fattening calves. When urea provides 20% to 25% of the nitrogen of the total ration, urea nitrogen is essentially equivalent to the nitrogen from conventional sources. Higher levels give poorer results with urea. Even though only 1% of urea in concentrate rations for fattening calves may reduce feed intake because of unpalatability, nitrogen from urea satisfactorily replaces up to 25% of the nitrogen required by fattening steers.

Sheep: Results of urea for protein replacement for lambs have not been consistently good. Up to 25% of the nitrogen in the ration may be supplied by urea, but higher levels give poor utilization. About 1/3 of the nitrogen in rations for pregnant or lactating ewes may be supplied by urea.

Since urea is so readily soluble, it remains available to the bacteria in the rumen for only a relatively short time. Ammonia not used when urea is hydrolyzed is absorbed into the blood and eventually excreted. This represents a loss to the animal. Studies on the combined use of more than one non-protein nitrogen compound (urea and biruet) indicate that nitrogen becomes available in more even amounts and over a longer period of time than when urea is used alone.

The possibility of urea toxicity (so-called "urea poisoning") in ruminants is unlikely. Although it has been demonstrated experimentally, the unpalatability of feeds containing high levels of urea is a built-in safeguard to animals. Normally, the quantities of urea used in practice are less than the apparent toxic level. Certainly, feeds containing urea should be well mixed to avoid possible trouble.

Summary

In practical feeding, urea may safely constitute 3% of the concentrate ration and 1% of the total ration. For best performance, the intake of urea for cattle should not exceed 0.2 lb. per head daily or not more than 1/3 of the protein requirement. The daily intake is the important factor.

Although many livestock owners prefer to rely on natural feeds for the supply of protein, urea is an important and relatively reliable adjunct to the proteins available for feeding. Used in the proper proportions, urea can be effective in economical rations that will give satisfactory results with ruminant animals.

Public Relations Program Continues in 1961

A 5-way campaign of public education, encouraging animal owners to make greater use of their veterinarian's services, will be continued nationally in 1961 by American Foundation for Animal Health.

The campaign will be underwritten by member companies of Associated Veterinary Laboratories.

Highlights include:

Farm magazines—82 national, regional and state farm publications to be supplied with monthly feature articles.

Daily newspapers—681 dailies and news bureaus to be furnished timely news articles on animal disease subjects throughout the year.

Weekly newspapers—1,452 weekly and small town daily papers to be supplied with monthly syndicated columns on animal disease problems and the values of veterinary service.

Television—163 stations to be furnished monthly programs.

Radio—405 radio stations to be provided with an average of ten animal health bulletins per month, each stressing veterinary service.

Bovine Dental Crowns Introduce New Professional Service

WARD C. NEWCOMB, D.D.S.

The science of preventive bovine dental care has been substantially advanced by the studies of a practicing dentist, Dr. Ward C. Newcomb, who was raised in the sandhill cattle area of Nebraska. After almost 2 years of study, Dr. Newcomb has made available to the veterinary profession stainless steel crowns which have proven practical in extending the useful life of cattle. In the recent report to VM, Dr. Newcomb gives a capsule review of this interesting field of study.

The full dentition of the cow's incisor teeth, 8 in number are supported in their semicircular position by the cementum of the root, the periodontal membrane and the alveolar bone, the supporting bone and the gingiva. These tissues are collectively called periodontium. The gingiva is usually pink in color, stippled and adherent to the cervical portion of the teeth, with fairly thick margins and well formed papillae. Each of the 8 incisor teeth is anatomically contoured and positioned in well-formed arches which occlude or articulate with the matching gummy pad on the maxilla bone.

The extreme length of the periodontal membrane of these teeth is interesting, with the center incisor seeming to have the longest membrane. This shows itself in extensive movement of these teeth. Each tooth moves slightly down and forward as biting pressure is applied. On release of pressure the tooth rises back into its resting position.

In the resting position correct nutrition of the tooth by its apical artery and vein is achieved. Thus if a tooth is painful, its condition would become more acute with active feeding and be improved if the tooth is allowed to rest for a greater length of time. This forced rest shows up as loss of milk supply or lack of fertility.

Incisor Eruption

It has been noted that the central incisor erupts first at approximately 2 years of age, and the enamel covering on the occluding surface is worn completely away in approximately 2 years, leaving the softer dentine exposed. The softer dentine, being more prone to wear, leaves a 4-year-old central incisor with a natural cupping in the occluding surface. This tooth, because of its thin and worn surface, is hypersensitive to any thermal change in water or food. The animal at this time can be said to be a partial dental cripple. As the years progress and more of the incisor teeth erupt and abrade, the condition multiplies and becomes much more evident.

The rate of abrasion varies widely with conditions such as wet or dry years, types of grasses, etc. In short grass areas with much free sand, the incisor tooth's useful life is as low as 7 years, which is 5 years after the central incisors erupt. It has been observed that the productive lives of cattle closely parallel the abrasion rate of the incisor teeth. Early and continued hypersensitivity of these teeth is also a factor in early loss of milk supply, general condition and nutrition of the animal.

Crowns Protect Incisors

The bovine crown was developed to stop premature abrasion and insulate the hypersensitive nerve of the incisors by the use of dental adhesive. Individual crowning of teeth allows for the natural function of each tooth and for normal hygiene around the supporting structures.

Crowns are designed to be self-retaining, using natural stainless steel spring action to prevent catching of hay or irritation to the gum or lip. Some crowns have now been in place 18 months. Abrasion tests show that these crowns will last 16½ years, and it is believed that they can safely be expected to last 3 to 5 years.

Crowns are supplied in 6 different shapes for incisors and in 2 shapes for the cuspid teeth for minimal physical effort in installation and a smooth gingival area around each tooth.

To correctly place crowns, the tooth must be dry. A mouth and tongue block is used for this purpose and the head raised to avoid saliva flow. After preparation of the cement, the tooth is dried with thymol and alcohol and dried again. The crown is filled half full of cement and pushed in place. Excess cement around the crown will wear away in several weeks.

Training clinics will be established around the country to help veterinarians become familiar with this technic, but Dr. Newcomb suggests that most local dentists will be pleased to give their time and know-how, if you are getting started with this technic.

Antibiotics in Milk

Concentration and Persistence after Parenteral Administration

There is much public health interest today concerning antibiotic residues in milk. This investigation was conducted to provide additional information on concentration and duration of antibiotic residues in milk. Oxytetracycline in doses of 2.5 gm. or less per cow given intravenously was not detectable in milk. Oil-base penicillin preparations did not adulterate the milk, but large doses of aqueous penicillin and smaller doses of a penicillin/streptomycin combination did adulterate the milk.

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MICHAEL PURKO
Wyoming State Department of Agriculture

Numerous studies have been undertaken to obtain information concerning the concentration and persistence of penicillin in the milk of cows following systemic administration. However, limited studies have been reported concerning other antibiotics.

Seeley[1] and Watts[2] have reported no measurable amounts of penicillin detected in milk of cows injected intramuscularly with 500,000 and 1,000,000 units respectively. Significant amounts of penicillin were detected in the milk of cows when levels were maintained by repeated intramuscular injections of 10 million units of dibenzylamine penicillin G.[3] Similar results were obtained when cows were given high levels of penicillin subcutaneously.[3] Randel[4] reported longer persistence of penicillin in the milk following treatment with the oil-base type. Vaid and co-workers[5] determined penicillin levels in milk following intramuscular administration of the aqueous suspension and oil-base types. They found higher concentrations in the milk from those cows receiving the aqueous suspension. However, penicillin persisted for a longer period of time after administration of the oil-base

type. The drug persisted for 48 and 96 hours respectively when measured as low as 0.01 units/ml. Blobel[6] administered intramuscular doses of 3,000 and 6,000 units of penicillin per lb. of body weight of both the aqueous and oil bases. Penicillin residue in the milk did not persist for longer than 60 hours for the aqueous suspension and 132 hours for the oil base, with sensitive readings as low as 0.01 units/ml. or less. Both Vaid and Blobel reported considerable variation in the levels of penicillin G in the milk from different cows of the same series of injections.

Hollister *et al.*[7] studied the residual effects in blood and milk following intramuscular injections of aqueous benzathine penicillin V. Using one injection of 6 million units, they were able to detect measurable amounts, from 0.05 to 0.01 units/ml., in both milk and blood, to 120 hours. Similar results were obtained after repeated doses of 3 million units were administered. They also reported wide variations among individual cattle and mentioned possible inaccuracies of assay methods.

Some workers in Europe,[8,9] using various levels of penicillin in systemic treatments, have reported only small amounts in the milk. They considered the milk safe for cheese making after the 3rd or 4th milking. Residue levels of 0.05 units/ml. were considered as the critical level and this amount or less would not affect cheese starters.

Foremost in the matter of antibiotic residues, as related to public-health programs and policies, is that of penicillin showing up in the milk of cows treated in various ways. This phase of the antibiotic problem has been recently summarized by Gessert[10] and Stephens[11] and is beyond the scope of this report. The purpose of our investigations was to provide additional information on antibiotic concentration and duration for state and local authorities who wished to see more work on the problem.

TABLE 1. Amount of Antibiotics in Milk Following Intravenous Administration (Sensitivity of zone readings in micrograms per ml.)

Group	No. Cows	Antibiotic Used	Dosage per cow	No. Treatments	Hours 2	12	24	36	48	60	72
1*	5	oxytetracycline	1.5 gm.	1	0	0	0	—			
2	3	"	2.5 gm.	2	0	0	0	—			
3	2	"	3.5 gm.	3	0.1-0.5	0.1-0.5	0.1	0			
4	2	"	3.5 gm.	1	0.1-0.5	0.5	0.2-0.5	0			

*Group 1 includes those cows in groups 2 and 3 given the first treatment.

Amount of Antibiotics in Milk following Intramuscular Administration (Sensitivity of zone readings in units per ml.)

Group	No. Cows	Antibiotic Used	Units/lb. body wt.	No. Treatments		2	12	24	36	48	60	72
5	2	Procaine Penicillin G Aqueous	2000●	1		0	0	0	—			
6	2	Benzathine Pen. G and Procaine Pen. G Aqueous	2500	1		0	0	0	—			
7	2	Procaine	7500	1		0.05-0.3	0.05-0.1	0	—			
		Penicillin G	7500	2		0.05	0.05 (1 cow)					
		Aqueous	7500	3		0.1	0.1	0	—			
8	4	Iomycin● (Norden Laboratories)	1500	1		0.1	0.5-0.1	0	—			
9	2	Procaine Pen. G in oil	2500	1	Milk	0	0	0	0	0	0	0
					Blood	1.0-2.0	2.0	0.1-1.0	0.1-0.5	0.05	0.03	0
10	2	"	7500	1	Milk	0	0	0	0	0	0	0
					Blood	3.0-10.0	2.0	0.1-1.0	0.1-0.7	0.1	0.07	0.05

Experimental Procedure

Lactating Holstein cows from the university dairy herd were selected for the various treatments. The cows were selected in small groups for preliminary trials with recommended doses. From these results, repeat injections and increased size of doses were determined. For intravenous injections, oxytetracycline (Terramycin, Pfizer) was the sole antibiotic used. Four different forms of penicillin were used for intramuscular injections. The data were obtained at different intervals during the months of May, June and July 1960.

Antibiotic levels of milk and blood serum were analyzed in the State Chemical and Bacteriological Laboratory using the rapid disc assay method of Arret and Kirshbaum.[13] All morning samples were plated soon after collection. Evening samples were refrigerated until the following morning.

Previous to the parenteral treatments, the entire milking herd had been tested for mastitis and the infected cows treated by udder infusion to the point where the herd was comparatively free of infection; hence, mastitis was not a factor in interpreting our results.

Results and Discussion

Sampling and assay methods for this experiment were similar to those used in the field by public-health workers. Interpretation of readings of the size of zone of inhibition in the disc-assay method is probably subject to slight experimental error. This method will actually measure adulteration lower than 0.05 units/ml. of penicillin or 0.05 micrograms/ml. of the other antibiotics. Our interpretations were at the 0.05 level or higher. Had we used more sensitive assay methods, our antibiotic persistence would probably be of longer duration than those shown in Table 1.

Antibiotic residues for various systemic injections are shown in Table 1. Minimum recommended doses were administered to cows in Group 1, and all milk samples were negative. The amount of antibiotic was increased at 24-hour intervals until a measurable amount of antibiotic residue was found in the milk. Our results are comparable to those of Schipper reported by Peoples and Pier,[15] who found levels from 0 to 5.0 units/ml. after intravenous injections of 3 gm. and 5 gm. respectively. Two of the 5 cows received only 1 injection and 1 cow in Group 2 was not given a 3rd injection. Two cows in Group 4 were given large intravenous injections to determine if the concentration and duration were any greater from a build-up of 3 repeated treatments as compared with a single large injection. There appeared to be little difference. Seven different cows were used for the intravenous treatments.

For intramusclar injections, Groups 5 and 7 were given between 2 and 3 million units per cow in 1 injection. No measurable amounts of penicillin were detected in the milk. These results appear to be comparable to those reported by Seeley[1] and Watts.[2] The 2 cows in Group 7 were each given 10 million units of aqueous penicillin in repeated doses. The repeated doses did not increase the concentration or extend the duration of penicillin in the milk over 1 single injection. Comparable results from other workers were reported by Plastridge[14] in his review of mastitis. Four cows in Group 8 were given recommended doses of a penicillin/streptomycin combination. The concentration of this antibiotic was greater at the 2-hour period than regular penicillin G; however, at 12-hour and 24-hour periods the concentration and duration were similar.

When penicillin in an oily base was administered in 3 and 10 million units (Table 1, Groups 9 and 10), no measurable amounts were detected in the milk. Blood-serum levels were higher and persistency was greater for the higher dosage.

Milk from all parenterally treated cows was discarded at the first milking, 2 to 3 hours after administration; all subsequent milkings were included in the herd milk. Bulk tank samples were tested for antibiotic residue and found to be negative. Only 2 to 4 cows of a milking herd of 35 were

given antibiotic treatment at any given time.

The data presented in this report indicate that intravenous administration of oxytetracycline will not adulterate milk until the dosage is greater than 2.5 gm./cow and that the antibiotic persists for less than 36 hours. There also appears to be no build-up of antibiotic concentration from repeated doses. With one exception, different penicillin preparations administered intramuscularly in dosages of 2 to 3 million units per cow did not adulterate the milk. A penicillin/streptomycin preparation, when given according to recommendations of only 1½ to 2 million units per cow, adulterated the milk like large doses, 10 million units, of aqueous penicillin. In our trials with 2 cows, using large doses of an oily-base penicillin, no measurable amounts were detected in the milk. Our results also indicate that the aqueous-base preparations show higher concentrations in the milk than the oily-base type; these findings are similar to those reported by Vaid.[5] Measurable amounts of penicillin persisted in the milk for less than 24 hours in all cases. Although limited studies were made, there appeared to be little relationship between blood-serum levels and milk levels.

Summary

Twenty-one lactating cows were parenterally administered different antibiotic preparations. Antibiotic levels of milk and blood serum were analyzed by the disc-assay method. After intravenous administration of 3.5 gm./cow, oxytetracycline levels from 0.1 to 0.5 micrograms/ml. were present in the milk and persisted for less than 36 hours. Dosages of 2.5 gm./cow or less were not detectable in the milk.

Four different penicillin preparations were administered intramuscularly in varying doses to groups of 2 or more cows. Except for an aqueous streptomycin/penicillin combination, doses of 2 to 3 million units/cow or less of either aqueous or oily-base preparations did not adulterate the milk. When 10 million units of the aqueous type were administered, levels from 0.1 to 0.05 units/ml. persisted less than 24 hours. Large doses of oily-base penicillin did not adulterate the milk, but blood serum levels of 3.0 to 10.0 units/ml. persisted for 84 hours.

REFERENCES

1. Seeley, H. W., Anderson E. O., Plastridge, W. N., and Pearson, P., Nonpermeability of the Lactating Bovine Mammary Gland to Penicillin. *Science*, 102:44, 1945.

2. Watts, P. S., and McLeod, D. H.. The Estimation of Penicillin in Blood Serum and Milk of Bovines after Intramuscular Injection. *Jour. Comp. Path.*, 56: 170, 1946.

3. Welsh, M., and Langer, P. H., Penicillin Blood and Milk Concentrations in the Normal Cow Following Parenteral Administrations. *Science*, 108:185, 1948.

4. Randall, W. A., Durbin, C. G., Wilner, J., and Collins, J. H., Antibiotic Concentration and Duration in Animal Tissue and Body Fluids. In "Antibiotics Annual 1953-54." Medical Encyclopedia, Inc., New York, N. Y.

5. Vaid, Y., Prouty, C. C., Shaw, A. O., and Watts, R. E., Penicillin Levels in Milk Following Parenteral Administration of Procaine Penicillin G. *Jour. Dairy Sci.* Abstract, 43:842, 1960.

6. Blobel, H., and Burch, C. W., Concentration of Penicillin in Milk of Cows Following Intramuscular Administration. *Jour. Am. Vet. Assn.*, 136:477, 1960.

7. Hollister, C. J., Huebner, R. A., Boucher, W. B., and DeMott, T., Parenteral Benzathine Penicillin V in Bovine Mastitis. *Am. Jour. Vet. Res.*, 20:287, 1959.

8. Hovmand, H. C., and Overby, A. J., The Bacterial Effect and Excretion of Dipenicillin and "Leocillin" after Intramuscular Treatment. *Medlemsb. danske Dyrlaegeforen*, No. 24, 1955.

9. Redaelli, G., The Persistence of Penicillin in Milk Inoculated in Various Ways. *Atli Sco. Ital. Sci. Vet.*, 12:663, 1958.

10. Gessert, A., Food Additive Legislation as it Affects Veterinary Medicine. Mimeo. paper. The Upjohn Company, Veterinary Medical Department, Kalamazoo, Mich.

11. Stephens, M. R., Policies and Programs Concerning Antibiotic and Pesticide Residues in Milk. *Jour. Dairy Sci.*, 43:580, 1960.

12. Arret, B., and Kirshbaum, A., Rapid Disc Assay Method for Detecting Penicillin in Milk. *Jour. Milk and Food Tech.*, 22:329, 1959.

13. Peoples, S. A., and Pier, A. C., Drug Levels in Milk. *Mod. Vet. Pract.*, 41:26, (July) 1960.

14. Plastridge, W. N., Bovine Mastitis: A Review. *Jour. Dairy Sci.*, 41:1141, 1958.

15. Tucker, E. W., and Fuller, R. W., Blood and Milk Levels Following Intramuscular Injection of Dibenzylamine. Penicillin G and the Effect on Streptococcus Agalactiae Infection of the Bovine Udder. In "Antibiotics Annual, 1953-54." Medical Encyclopedia, Inc., New York, N. Y.

16. Welsh. H., Jester, W. R., and Burton, M., Antibiotics in Fluid Milk. *Antibiotics and Chemotherapy*, 5(10):571,1955.

The authors wish to express appreciation to Constance Hyre, bacteriologist, for laboratory assistance in conducting the disc-assay analyses.

Winter Nutritional Notes

Vitamin A Studies

Dr. G. E. Mitchell, Jr. at Illinois Cattle Feeders Day, reported that a vitamin A deficiency was unexpectedly found in steers on feeding experiments. Alfalfa meal was fed to supply at least the equivalent of 7,000 IU per head daily. Tests indicated that there were only 1,000 IU in the feed. Later tests indicated fluctuations between a low of 4,000 IU and a high of 11,000 IU with an average of 8,135 IU.

The calves had been doing well, gaining 2.07 lb. and consuming 20.1 lb. of ration daily. The first indication of the deficiency was a rather sudden reduction of feed intake in about half of the steers. Careful examination then detected other symptoms of vitamin A deficiency, *e.g.*, lameness, edema in the brisket, knees, hocks and coronary regions, dull haircoat, night blindness in some, looseness of joints or muscles in some, resulting in an extreme open-shouldered condition and convulsive seizures when cattle were moved about rapidly. No excessive lacrimation or inflammation of the eyes was observed and only an occasional animal had diarrhea.

For a vitamin A study, the deficient steers were divided into 3 groups. One control group and the other 2 each received extra supplementation of 21,000 IU of vitamin A or its equivalent as supplied by the carotene in alfalfa leaf meal. In addition, carotene was supplied by the basal ration. This intake varied according to feed consumption with the control lot getting the equivalent of 6,992 IU, 8,474 IU for the Vitamin A lot and 7,904 IU for the carotene lot. Normal requirements for these steers were probably about 9,000 IU per head daily, as they averaged about 900 lb.

Both groups receiving vitamin and carotene supplements showed a dramatic increase in appetite in less than a week, along with marked improvement in rate of gain and feed efficiency. The vitamin A supplemented lot gained more than twice as fast as the control group and the carotene lot 80% faster than the controls. It is interesting to note that the cheapest treatment was with the commercial vitamin A supplementation.

The Illinois work tends to help prove these points:

1. Vitamin A deficient animals cannot utilize carotene properly and will respond better with actual vitamin A therapy.

2. Vitamin A deficiency may occur even with the best of rations, because the carotene supply and availability tends to be variable.

3. Symptoms vary with the individual in groups of animals.

4. Recent high nitrogen fertilization of farm crops has resulted in some nitrate poisoning in animals. Carotene utilization is interfered with and vitamin A deficiency results. In this experiment, the corn-cob

part of the nation was negative for nitrates.

5. Phosphorus is important for proper conversion of carotene. Phosphorus supplementation has been known to overcome vitamin A deficiencies by making carotene available.

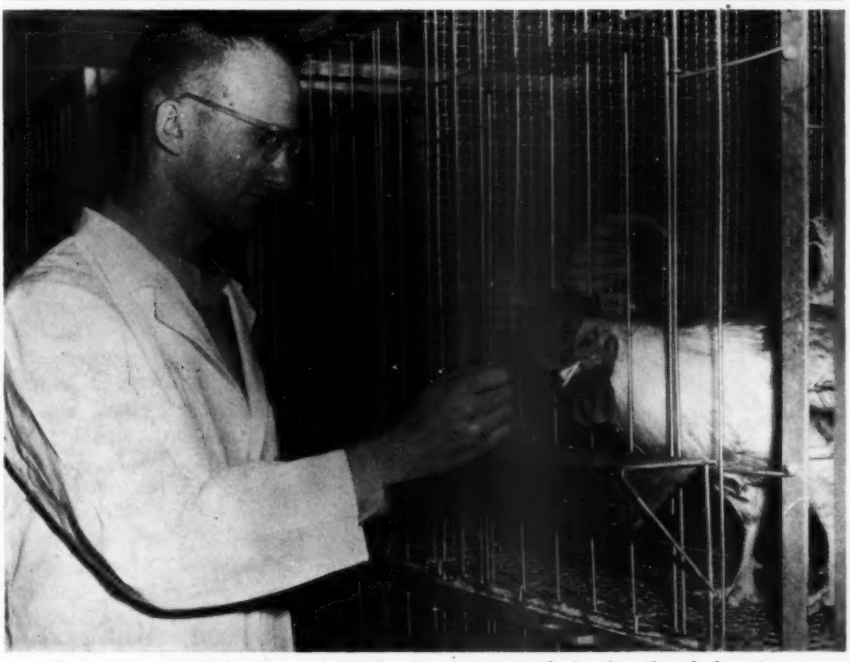
6. L. Meyer Jones, (in Veterinary Pharmacology and Therapeutics, 2nd. Ed., p. 720) recommends an initial therapeutic dose of 10 to 20 times the daily requirement of vitamin A, then 3 to 5 times the normal requirement for 7 to 10 days. NRC recommends 1,000 IU per 100 lb. as the normal daily allowance for beef cattle. The initial therapeutic dose would then be 10,000 to 20,000 IU per 100 lb. with later daily doses of from 3,000 to 5,000 IU per cwt.

Daily therapeutic doses in the experiment would then have been from 27,000 to 45,000 IU per head. The steers did well receiving a dose of 21,000 IU daily for 42 days. They apparently did even better when the dose was increased to 100,000 IU daily for another 2 weeks.

Dr. W. M. Beeson, animal nutritionist at Purdue, recently stated that he is becoming convinced that high-nitrogen fertilization of corn is causing vitamin A shortage in livestock diets, even though calculations show the carotene content of rations to be ample. He thinks free nitrates and nitrites may be interfering with carotene utilization.

Synthetic vitamin A in the drinking water is a practical way of getting an early start on severe deficiency cases. Often animals too sick to eat much are still drinking water and will respond more rapidly when medicated in this manner. Appetite will soon improve enough to make feed medication practical.

Small doses of vitamin A given frequently are more efficient than large infrequent doses. This is another indication for water medication rather than depending



A rooster scrutinizes a spoonful of concentrated food offered by Capt. George Anstedt in space medicine by Air Force Veterinary Service at Brooks Air Force Base, San Antonio.

wholly on hypodermic administration in severely sick animals.

The proper dose should be put in the drinking water daily, because potency cannot be expected to be maintained very long.

Nervous Cattle

Recently, several veterinary practitioners have inquired concerning a nervous condition in cattle. Occasionally, an individual may get excited when being handled, go into spasms and go down. After a time, excitement subsides and the animal gets up apparently normal. A careful examination may reveal other symptoms of a vitamin A deficiency, which is perhaps the main cause of the nervousness most frequently found in beef cattle.

Foot-Rot Therapy

Have you ever used vitamin A to treat foot-rot in cattle? It apparently has some merit because some cases have improved following its use. A necrophorus infection of the foot follows as a result of vitamin A deficiency and lowered resistance of the skin.

Foot-rot sometimes occurs in hot summer weather after a drouth has dried up pastures and the mud hole sources of infection. This may be a vitamin A deficiency. Do readers have some ideas or suggestions? We would like to hear from you.

Sows Need Iron

Mature swine also need iron supplementation at other times in their life cycle, when kept in confinement. Deficiencies have frequently been found during the growing-finishing period. Two veterinarians reported finding hemoglobins of 4 and 5 in sows during the gestation period. They had been on concrete and had no iron supplementation in the ration.

E. E. Slater, D.V.M.

Muscular Dystrophy Studies in Ewes

The Wisconsin Agri. Exp. Station reports that when ewes both during pregnancy and lactation were fed fish liver oil mixed with the grain ration, muscular dystrophy resulted presumably because the oil lowered vitamin E in the blood plasma of both ewe and lamb. On the other hand, when vitamin E was administered to the ewes, it counteracted the effect of the fish liver oil so that no muscular dystrophy resulted, and vitamin E was also effective in curing the ailment in lambs. A combination of fish liver oil and selenium, in the hands of the Wisconsin researchers, was not as completely effective as the vatamin E and oil.

R. R. Dykstra, D.V.M.

Paratuberculosis In Cattle

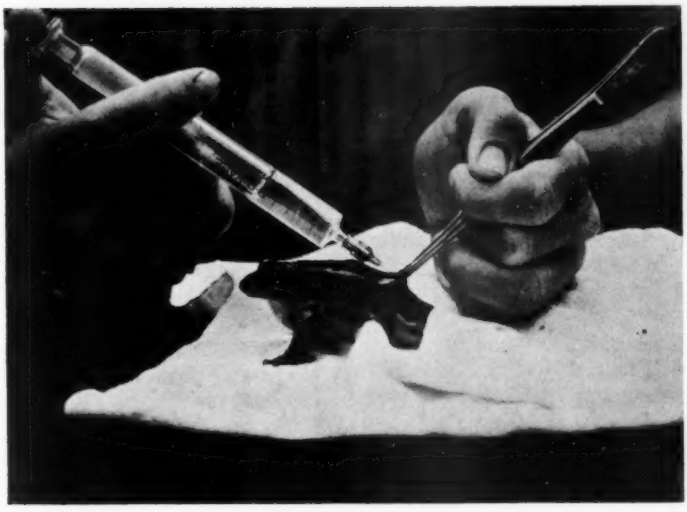
Johne's disease (paratuberculosis of cattle), caused by *Mycobacterium paratuberculosis,* is of interest to American veterinarians because of its close relationship to bovine tuberculosis.

Two French veterinarians, Fouquet and Delauney, published their work on paratuberculosis in the June 1960 issue of *Ricueil de Medecine Veterinaire.* Their observations are that *M. paratuberculosis* flourishes only when there is a lack of potassium in the animal's diet. In the presence of enough potassium, the causative organism remains in an avirulent, saprophytic state. Therefore, supplying *M. paratuberculosis* infected cattle with enough potassium in the diet causes the organism to become dormant, and the clinical progress of the disease is stopped. According to the unknown author of "A New Approach to Veterinary Therapeutics", which appeared in the November *New York City Veterinarian,* this is an entirely new approach to therapy. This type of therapy, substantiated by research, could have infinite possibilities in the treatment of many diseases.

R. R. Dykstra, D.V.M.

VM

Practitioner's Laboratory



Pregnancy Testing

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Veterinarians are often requested by physicians to perform human pregnancy tests. The Friedman or rabbit test and the Aschheim-Zondek or mouse test have long been standard. In 1947, toads *(Bufo. spp.)* were found to be a satisfactory species for pregnancy testing. Later, certain frogs *(Rana spp.)* were found to serve equally well. There are many other tests for pregnancy, which are reviewed by Cowie.[1]

The frog test has the advantages of rapidity (1 to 2 hours), availability of frogs commercially and ease of care for the frogs. The disadvantages of susceptibility to urine "toxins" and insensitivity to low hormone content urine in amounts readily injected (5 ml.) can be overcome by a concentration technic to be described.

Male frogs *(Rana pipiens)* are available from dealers or biology supply houses.

They can be kept in the refrigerator at 35 F. to 40 F. for 2 to 4 weeks and do not require feeding. Pyrex oven dishes containing water and flat pieces of cement, so that the frogs can crawl out of the water, should be used. The water must be changed daily.

Equipment

Pasteur pipette or fine-tipped medicine dropper.

Wide-mouthed gallon jars for holding frogs.

10 ml. syringe and 27 gauge needle for injecting urine.

Nitrazine paper (Squibb), (*p*H range 4-5-7.5).

Rat-toothed thumb forceps.

Towel for holding frogs.

20% suspension of acid-washed kaolin.

0.1 N NaOH.

5% HCl.

20% HCl.

10 ml. pipette.

Two 5 ml. pipettes.

4 oz. prescription bottle or other container.

Conical centrifuge tube, 15 ml.

Stirring rod.

Microscope.

Centrifuge.

Microscope slides.

A 4 oz. specimen of urine should be requested. Three frogs are injected per test, 2 with 5 ml. of undiluted urine and 1 with the chorionic gonadotropin extracted from 90 ml. of urine.

Procedure

1. Using the Pasteur pipette or medicine dropper inserted into the cloaca of the frog, obtain a specimen of urine of each frog to be used. Examine under the microscope for spermatozoa. Only frogs with urine negative for spermatozoa can be used. Often frogs will urinate when handled and use of the catheter is unnecessary.

2. Test *p*H of 10 ml. of urine with nitrazine paper. If necessary, add 5% HCl, drop by drop, until *p*H is acid (greenish yellow on nitrazine paper).

3. Holding the frog as in Fig. 1, 5 ml. of urine is injected under the skin of the back (into the dorsal lymph sac) of each of two frogs.

4. After 1 to 2 hours, repeat step 1. The presence of spermatozoa indicates chorionic gonadotropin in the urine, and, therefore, pregnancy. The absence of sperm indicates no living placental tissue, which produces the hormone, and, therefore, absence of pregnancy.

Hormone Concentration Technic: In very early pregnancy, or if for some reason the hormone concentration in the urine is low, the test outlined above may give false negative reactions. Therefore, 90 ml. of urine is used for extraction of the hormone.

1. Acidify 90 ml. of urine to definitely yellow color on nitrazine paper (*p*H 4.5) with 20% HCl, (2-5 ml.).

2. Add 10 ml. of 20% kaolin suspension.

3. Stopper and shake vigorously for 2 minutes to adsorb hormone to the kaolin particles.

4. Allow to sediment (or centrifuge) until supernate is clear.

5. Decant or siphon off supernatant fluid and discard.

6. Add 2.0 ml. of 0.1 N sodium hydroxide and mix thoroughly with stirring rod to elute the hormone.

7. Check *p*H of suspension with nitrazine paper which should turn deep blue, indicating a *p*H above 7.0 Add more NaOH if necessary.

8. Transfer to small tube and centrifuge.

9. Pour or draw off clear supernatant with syringe and needle.

10. Add 5% HCl drop by drop until nitrazine paper turns yellow, (*p*H 5-6).

11. Inject this solution into a frog as in step 3 under "Procedure." Read 1 to 2 hours later as in step 1 under "Procedure."

Precautions

Prior to injection, frogs must be checked

carefully for sperm. This is especially important during their breeding season in the spring. In the summer, *Rana pipiens* become insensitive and *Rana clamitans, Bufo valliceps* or *B. woodhousii,* or other suitable species should be substituted. Any of these species can be reused after 4 or 5 days.

Care must be taken to use only males. Male *Rana pipiens* emit a noise when handled, whereas females are quiet. The male has a pigmented thumb, enlarged at the base. The *Bufo spp.* males have throats relatively more pigmented than females and often have horny excrescences on the thumb and the first finger.[2]

In order to avoid low hormone content urines, the patient should be 2 weeks beyond the normally expected menstrual period (about 28 days pregnant) at the time the urine for testing is obtained.

Hormones other than chorionic gonadotropin will not interfere with the test; however, Sparine and Thorazine cause false positive reactions.[3]

Other Uses: Chorion epithelioma can be diagnosed by use of commercial chorionic gonadotropin of known potency to establish the degree of sensitivity of the test frogs and titration of the patient's urine by injection of serially diluted samples to the endpoint of positive reactions.

The test can be used to differentiate between threatened and missed abortion, as it becomes negative 12 to 24 hours after removal or death of the placenta.

Unfortunately, according to Cowie,[4] the only established hormonal test for diagnosing animal pregnancies is the test using mare serum in mice or rabbits.

Veterinarians contemplating offering this service should prepare themselves by reference to more complete works on the subject[5,6,7,8,9] and by the use of known positive and negative urines.

REFERENCES

1. Cowie, A. T., Pregnancy Diagnosis Tests: A Review. Commonwealth Agricultural Bureaux Joint Publication #13. 1948.

2. Wright & Wright., Handbook of Frogs and Toads. Comstock Publishing Co., Ithaca, N. Y., 1949.

3. Hilbert, G. H., False Positive Pregnancy Tests Caused by Sparine and Thorazine. *Jour. Fla. Med. Assn.*, 45:655-657, (Dec.) 1958.

4. Cowie, A. T., Pregnancy Tests. *Vet. Rec.*, 63:371-372, 1951.

5. Miller, D. F. and Wiltberger, P. B. Some Peculiarities of the Male Frog Test for Early Pregnancy. *Ohio Jour. Sci.*, 48:89-94, 1948.

6. Giltz, M. L. and Miller, D. F. Ways of Improving the Male Frog Test for Pregnancy. *Ohio Jour. Sci.*, 50:2-5-209, 1950.

7. Brandfass, Carl Jr. and Massa, E. J., The Male Frog Pregnancy Test. *Dennison Univ. Bul., Jour. of the Sci. Labs.*, 41:46-65, 1949.

8. Hon, E. H., The Clinical Value of Current Pregnancy Tests. *Conn. State Med. Jour.*, 20:430-436, 1956.

9. Robbins, S. L. and F. Parker, Jr., The Use of the Male North American Frog (*Rana pipiens*) in the Diagnosis of Pregnancy. *Endocrinology*, 42:237-243, 1948.

Dogbites of Face

Dogbites of the face call for immediate, skilled treatment, although the danger of infection is not so great as originally was believed. The treatment of choice is prompt, thorough but gentle cleansing, irrigation and primary closure by careful approximation of the wound edges or the use of pedicle tissue where required.

The author suggests cleansing of the wound and surrounding skin with mild soap and water and irrigation with "copious amounts" of sterile isotonic saline solution. Antiseptics should not be used in the wound since they are harmful to traumatized tissue. Their application to the surrounding skin is permissible, however. With good general wound care, the danger of infection is no greater than in other facial wounds.

Complete debridement to include the skin edges and deepest part of the wound is preferable. Conservation of tissue is of major concern. To leave facial dogbites to heal by secondary intent, with resultant deformity, is inexcusable in the light of present knowledge.

Tetanus immunization and prophylactic penicillin and streptomycin are advised. The author believes, however, that rabies vaccination should be given only in the case of an extensive wound when the dog cannot be examined or when the dog is known to be rabid.

Medical Times 88:1218, (October), 1960.

Observations on the Parasites of the Domestic Cat

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Parasites were collected by the author from some 40 cats at the Veterinary Research Laboratory, Blantyre, Nyasaland. Most of these animals were ownerless town strays brought to the veterinary department for euthanasia but a number were the victims of road accidents, rabies, or feline enteritis.

The parasites collected and observations on some of them are recorded below.

List of Parasites Observed

Protoza—*Isospora bigemina* var. *cati* (Stiles, 1891).

Cestoda—*Hydatigera taeniaeformis* (Batsch,, 1786).
syn. *Taenia taeniaeformis* (Batsch, 1786).
Dipylidium sexcoronatum (von Ratz, 1900).
Joyeuxiella pasqualei (Diamare, 1893).
Mesocestoides lineatus (Goeze, 1782).

Nematoda—*Ancylostoma tubaeforme* (Zeder, 1800).
Bronchostrongylus subcrenatus (Railliet & Henry, 1913).
syn. *Haemostrongylus subcrenatus* (Railliet & Henry, 1913).
Chlamydonema praeputiale (von Linstow, 1889).
syns. *Physaloptera praeputialis* (von Linstow, 1910).
Chlamydonema felineum (Hegt, 1910).

Insecta—*Ctenocephalides felis felis* (Bouché, 1835).

Isospora bigemina: A litter of stray kittens was very heavily infected with this protozoon, but showed no visible signs of ill health.

Hydatigera taenaeformis: This tapeworm appears to be very localized in its distribution. It was limited to a number of stray cats caught in the vicinity of the Blantyre railway sheds. A large number of black rats (*Rattus rattus*) caught in this shed

carried *Cysticercus fasciolaris* in their livers, yet this bladderworm was only recovered once from rats caught in other parts of the town. It would seem likely that this parasite was introduced by rats traveling up from the coast by train and that it is not enzootic. One of a pair of 6-week-old kittens fed on infested rat livers and destroyed 3 months later, contained 20 tapeworms. It had grown only slightly less rapidly than the control and except for a slight tendency to be pot-bellied, showed no signs of ill health. It should be pointed out, however, that the kittens were fed a rich diet of freshly killed laboratory mice, beef liver and milk.

Joyeuxiella pasqualei: This tapeworm, frequently confused with *Dipylidium*, which it resembles superficially, was far commoner than the latter. It is the commonest tapeworm of cats in this area. It passes part of its life cycle in lizards, including the common skink *Mabuya striata*, which abounds in all gardens and roadside drains. This lizard is frequently caught and eaten by cats. There would seem to be little doubt that the presence of considerable numbers of this parasite in the definitive host causes loss of condition. This substantiates the belief so widely held in Africa that cats that eat lizards grow thin.

Mesocestoides lineatus: This tapeworm was fairly common in rural dogs, but was only rarely encountered in cats.

Ancylostoma tubaeforme: This very common hookworm of cats in Nyasaland has hitherto been recorded as *A. caninum*, to which it bears a close resemblance. It was present in small numbers in the middle 3rd of the small intestine in nearly all adult cats in this area. It was frequently seen in larger numbers in younger cats. It appears to be fairly pathogenic to young cats exposed to heavy infection before they have been able to acquire a degree of immunity. The symptoms are diarrhea, occasional vomiting, anemia and emaciation. In some cases flecks of blood were noted in the feces, which are more than usually fetid. The writer has had the opportunity to examine hookworms collected from a large number of cats and dogs. *A. tubaeforme* was the species in cats and *A. caninum* in dogs. There would thus appear to be a strong species immunity. In *A. tubaeforme*, the caudal bursa was shorter, the total length of male worms between 8.5 mm. and 9.6 mm., of females between 9.6 mm. and 12.5 mm., and the spicules measured between 1.23 mm. and 1.4 mm. in length. In *A. caninum* the caudal bursa was longer, the total body length was between 8.5 mm. and 10.5 mm. in the males and 11.2 mm. and 15.3 mm. in the females, and the spicules measured between 0.8 mm and 0.95 mm. in length.

These morphological differences between the 2 species were first pointed out by Biocca. He also mentioned other, less obvious, differences.

Bronchostrongylus subcrenatus: This lung parasite of the leopard has not previously been recorded from cats. Its features and history are outlined in another paper by Fitzsimmons.[2] Since leopards are still very common in this locality, it is easily appreciated how the parasite could be transmitted to cats, for it has an indirect life cycle which passes through molluscs with rodents as secondary or transport hosts. Its pathogenicity is not known but would seem to be negligible.

Chlamydonema praeputiale. This spirurid parasite of the stomach of cats was common and widespread. Its presence was always associated with erosions and marked inflammation of the gastric mucosa.

REFERENCES

1. Biocca, E., Ridescrizione di *Ancylostoma tubaeforme* (Zeder, 1800) parassita del gatto, considerato erroneamente sinonimo di *Ancylostoma caninum* (Ercolani, 1859), parassita del cane. *Riv. di Parassit.*, 14 (4):267-278, 1954.

2. Fitzimmons, W. M. In press. (*Veterinary Record*).

The writer expresses his thanks to Dr. J. M. Watson, D.Sc., A.R.C.S., Director, Commonwealth Bureau of Helminthology, for permission to publish this paper.

Management of Canine Distemper Syndrome

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The mechanism of action of ACTH in treatment of canine distemper is not fully understood, but it has been successful for Dr. O'Brien during the past 5 years in his practice.

Clinical observations are difficult to accurately evaluate. This report is offered with the hope that others better equipped will become interested and further investigate this method of treatment of canine distemper.

Some time ago, a product combining ACTH and Vitamin B_{12} (ACB-12, Armour Pharmaceutical Co.) was proposed as useful in the treatment and management of the canine distemper syndrome. Though its value seemed doubtful, this product was tried for the treatment of canine distemper. For the past 5 to 6 years ACTH (Adrenomone, Armour) has been used to manage and treat this condition with apparent success. The total number of cases have not been recorded nor has the exact therapeutic regime used in each case. After several years of use, ACTH appears to prevent the appearance of nervous symptoms commonly associated with canine distemper.

The following is the therapeutic approach found to produce the most consistently favorable results. Upon presumptive clinical diagnosis of distemper, ACTH is administered at the rate of 1 unit per lb. of body weight. This injection is given intramuscularly unless a convulsion has already occurred, in which case it is administered intravenously. All cases are treated as outpatients, and each case is required to return in 48 hours for the 2nd treatment of the same dosage. Thereafter, ACTH is administered intramuscularly at intervals of 2 to 7 days, in doses of from ½ to 1 unit per lb. of body weight. The interval and dosage are varied according to the response of the patient. In general, this interval has been left to the client's discretion, with the admonishment that the animal be returned when it appears to be running out of gas, for lack of a better lay expression.

Salicylates and antibiotics are incorporated in this treatment regimen, according to the severity of the secondary symptoms that develop. ACTH therapy is thus continued until the animal's temperature drops below 102 F. and the injection of the scleral vessels disappears. This sometimes requires treatment for as long as 6 to 8 weeks. If treatment is discontinued prior to a drop in temperature, nervous symptoms soon occur.

Experience has shown that a good prognosis is justified unless the animal is completely shattered before treatment is begun. Successful management is possible by practical use of this treatment, even after onset of the convulsive stage, if the animal's general condition is good.

The following are some additional observations. Corticosteroids have not produced as good results as ACTH. No after effects have been observed after withdrawal of prolonged ACTH therapy. Antibiotics appear only to help control some of the commonly associated secondary infections. In high dosages, salicylates would appear to lengthen the interval before the need for additional ACTH therapy.

This is a continuation of the series of condensed reviews covering fundamental technics of equine practice. Readers are invited to contribute comments or experiences in horse practice.

Conditions of the Forelimb

Splints

A periostitis occurs, and irritation between the accessory metacarpal (or rarely metatarsal bones) causes the fibrous union to be replaced by bone.

Etiology: Unknown, except that it is a localized periostitis and continued use of young horses on hard surfaces is the exciting factor.

Symptoms: Most common in 2 to 3 year olds. Most frequent on the front leg. At first it is a supporting leg lameness that is more exaggerated on rough surfaces. The lameness becomes more severe as the animal is worked. An exostosis occurs at the end of the acute stage. Then an enlargement can be palpated in the metacarpal bones. This is usually in the upper 1/3 of the metacarpal bones.

High splint is in the region of the joint. This may result in permanent lameness. Low splint is away from the joint. The exostosis will often persist for several years, then disappear.

Prognosis: Generally favorable, as exostosis will often disappear in later years and lameness will leave unless joint is involved.

Treatment: In the early acute stage rest and cold pack. Enforced rest is the best treatment. Fire only if lameness persists, then down to the bone. Surgery is used to remove osseous tissue in show animals on low and medium splints.

Ringbone

An exostosis involving the 1st, 2nd and 3rd phalanges, in or around the pastern or coffin joint. It is most common in light horses and is quite rare in the hind leg. High (at or around the pastern joint). Low (at or around the coffin joint; it is felt just above the hoof).

Etiology: Inheritance is a factor. Too straight or too sloping pasterns predispose to this condition. Faulty nutrition may also be a factor.

Symptoms: First a supporting leg lameness, caused by a periostitis at the attachment of the ligaments. Later an exostosis appears. It is difficult to diagnose until exostosis occurs. The lameness is aggravated by turning on the affected foot and is often exaggerated just before exostosis appears.

Prognosis: Guarded, only about 50% will recover from the lameness. The exostosis usually persists.

Treatment: In the acute stage, rest. For

the chronic stage, firing and blistering followed by rest for a month or longer. Also, correct the nutrition by addition of bonemeal to the ration.

Luxation of the Fetlock

Etiology: Trauma, as catching the foot.
Symptoms: A swelling and the foot is displaced laterally or medially.
Prognosis: Better in young animals but is guarded.
Treatment: Replace under general anesthesia.

Side Bones

An ossification of the lateral cartilage.
Etiology: Trauma, conformation too upright and may be hereditary.
Symptoms: A mild, supporting leg lameness and palpation of the lateral cartilage reveals ossification. There is often a stilted gait that is more exaggerated on sloping ground.
Prognosis: Unfavorable as to removing but if animal is used on soft ground, it will not bother it.
Treatment: Reduce the pressure by cutting out a section of the hoof on the ground surface. Shoeing with leather pads will help to relieve pressure.

Navicular Disease

Inflammation of the navicular bursa. It is usually in the front feet and one of the most common diseases of light horses.
Etiology: A high sloping pastern, long hoof and concussion on hard surfaces.
Symptoms: First seen as a tendency to stumble, as the coffin joint is not fully flexed. The toe drags and wears off. At first there is a slight intermittent supporting leg lameness that will become more marked and more constant with time. Pointing is a common symptom. If unilateral, the affected foot points constantly, and if bilateral, it will shift. As an aid to diagnosis, place a board under the toe. The horse will not stand on it. As the condition continues, the heel will contract, frog will atrophy and the foot will become smaller from disuse.
Prognosis: Very poor. The disease will progress instead of regress.
Treatment: None good. Early shoeing to raise the heel and keep the pressure off the tendons. Rest and use only on soft ground if that is possible.

Acute Laminitis

An inflammation of the sensitive lamina of the sole and wall. It is common in the Shetland pony.
Etiology: Chilling of the skin when the animal is hot, usually from overfeeding, superpurgation and uncommonly, from metritis.
Symptoms: A sudden onset of severe pain in the feet. The animal resists being moved, attempts to place all weight possible on the hind feet and pivots on hind feet to turn. There is an increased temperature of the hoof and the digital pulse is quite marked.
Prognosis: Always should be guarded.
Treatment: First find the cause and correct it. Place the animal in cold water 1 to 2 hours at a time for at least 2 or 3 days to reduce swelling and congestion. Blood transfusions from a normal animal, 250 cc. *t.i.d.* for 2 to 3 days, are effective in some cases. Antihistamines given within 48 hours are of some benefit. Steroids are also of benefit within the first few days. Give the animal rest. Forced exercise is harmful.

Chronic Laminitis

Etiology: It usually follows acute, most often repeated mild attacks.
Symptoms: The structures of the foot degenerate, causing the animal to walk on its heels. As a result, the toes grow long.
Prognosis: Very guarded.
Treatment: For mild cases rest the animal and groove the hoofs. This is to allow the hoofs to expand. Keep the hoofs bandaged for 1 to 2 weeks following grooving.

To be continued in March issue.

Canine Pediatrics

D. M. Campbell, D.V.M., former editor of **Veterinary Medicine**, published a series of 12 papers on canine pediatrics in 1938 and 1939. These papers were prepared by Dr. Campbell in collaboration with Dr. G. C. Supplee and J. H. LeWare of Borden Research Laboratories, who were doing research in preparation of an artificial puppy formula. A condensation of these papers is offered to the readers of **Veterinary Medicine** as other veterinarians have indicated that much of the original material is equally valuable today.

It is a universally observed fact in nature that the young of all species are not equipped to assimilate and tolerate dietary substances on which more mature individuals thrive. The kitten cannot catch mice. The puppy does not have teeth with which to gnaw bones, and the human infant would reject beefsteaks and onions. Nature in her intricate plan to perpetuate life has made special provisions for nourishing each newly created individual of the species.

Milk is an abstract collective term for the substances upon which newborn mammals subsist until they can use normal adult food.

The milk of different mammals has only 1 factor in common, that is, its function to nourish the young for which it is intended. There are as many kinds of milk as there are species of mammals. The milk of each species differs from all others in the exact assembly of its chemical entities. The exact nature of any milk conforms to the pattern of its species and is predesigned for the use of the young which normally feed upon it. It is inevitable that this be so, for it is derived from blood. Blood, common to all mammals, varies with the physiological needs and capacities of the different species. Even the blood of individuals varies within species.

In the case of puppies, nature originally planned a thoroughly satisfactory diet, the bitch's milk. Certain changes in canine environment accompanying the intensification of civilization have shown their effects on the dam and puppies alike. The bitch's milk is no longer uniformly satisfactory and often is not available.

Almost every veterinarian and dog breeder have encountered the need for an adequate substitute for the bitch's milk. The most obvious and imperative need arises when the dam dies. Often, the need arises when the dam fails to lactate because of malnutrition, disease or emotional imbalance. Also, the mother may lactate but there is not sufficient quantity of milk for

the litter size. Many times bitches produce milk on which the puppies fail to thrive because the milk is not of suitable quality. Those qualitative deficiencies in the bitch's milk, which permit the young to obtain sufficient nourishment for subsistence but insufficient for normal growth and development, may be due in a majority of cases to an inadequate and improperly balanced diet of the bitch during the prenatal and the lactating period.

Broadly speaking, milk contains fats, carbohydrates, proteins, minerals and vitamins in proportions that vary with the species. Cow's milk is universally familiar and is a convenient standard with which to compare other milk.

Any milk, whether it be from a cow, a bitch or a human, is a colloidal system of lactose, certain soluble minerals, dispersed fats, and proteins in varying degrees of dispersion. The differences in degree of dispersion of proteins vary with the species and correspond with the specific capacities of digestion and assimilation of that species.

Table 1 shows a comparative composition of cow's and bitch's milk. Bitch's milk has about twice the total solids content of cow's milk; the fat and protein content of bitch's milk is 2½ times as great as cow's milk, while the lactose content is about 1/3 less in the bitch's milk. The mineral content of bitch's milk is about 29% higher than it is in cow's milk.

TABLE 1

	Cow's Milk	Bitch's Milk
Fat	3.54	9.00
Carbohydrates	4.65	3.10
Proteins	3.20	8.00
(Casein)	(2.70)	(3.50)
(Albumin)	(.50)	(4.50)
Minerals	.70	.90
Total Solids	12.09%	21.00%

The only carbohydrate found in milk is lactose. The differences in lactose content of milks of various species are entirely quantitative, yet this is important when considered in the variation of ratios of constituents.

While bitch's milk has 1/3 less lactose than cow's milk, the protein to lactose content is 1 to 0.39 in bitch's milk and 1 to 1.45 in cow's milk. There is a definite intolerance in puppies to any disproportionate amounts of lactose. The tendency of natural cow's milk to cause diarrhea and excessive dehydration can be controlled by correcting the lactose to protein ratio.

Fats are not universally or equally assimilated. Cow's milk contains fat of a character that cannot be fed in excessive or disproportionate amounts to puppies without causing digestive disturbances.

The metabolism and protein requirements of the newborn puppy differ from those of the calf. Cow's milk has too many of some proteins and not enough of others to meet the puppies' needs. Certain of the proteins in cow's milk are incompatible to the puppy. The puppies are able to assimilate some of the proteins of cow's milk and convert them to their own requirements, but this capacity for adaptation is not great enough for the puppy to thrive on cow's milk.

Parturition is a nutritive crisis for the young. It is a transition and adaptation from intra-uterine life to a less friendly extra-uterine existence. It is apparent that colostrum or 1st lacteal secretion is designed to cushion the nutritive shock of parturition and to continue normal development of the puppy.

Certain families among the mammals effect much of this transition during intra-uterine life. Human infants arrive in the world well prepared for extra-uterine existence. The newborn ruminants are quite dependent upon colostrum to establish normal nutrition. The canine species falls midway between these two. The puppy is not fully able to utilize or adapt easily to his needs a wide variety of proteins.

Next month there will be a continuation of canine pediatrics. It will deal with the caloric and fluid requirements of young puppies, feeding regimen and practical suggestions on rearing puppies.

Treatment of Canine Coccidiosis

M. RACHMAN, D.V.M.
Roselle Park, N. J.
S. POLLOCK, D.V.M.
S. Orange, N. J.

Coccidiosis has been recognized as the most important protozoal disease of the dog because of its frequency and pathogenicity. Its clinical manifestations cannot easily be distinguished from enteritis caused by other intestinal pathogens. For this reason, its diagnosis is based chiefly on microscopic identification of oocysts in the feces. Many methods of treatment of the condition have been used, from intestinal astringents to antiseptics, and subsequently sulfonamides, which have been somewhat effective particularly in *Isospora begemina* infections. In general, however, treatment is not yet entirely effective.

In 1947, Harwood *et al.*[1] reported on the anticoccidial activity of nitrofurazone in chickens. This compound since has proved effective in coccidial infections in poultry,[1] rabbits,[2,3] swine,[4] sheep and goats,[5,6] cattle,[7] and dogs.[8,9]

It is the purpose of this study to evaluate the efficacy of a nitrofurazone preparation (Furadex, Eaton Laboratories) as compared to sulfaguanidine and as opposed to nonmedicated controls in canine coccidiosis.

Materials and Methods

Fifteen beagles, 1 to 6 years old, obtained from a distributor, were used for this study. At the time of their acquisition all dogs were in apparently good physical condition with normal temperature, and for protection, each dog was vaccinated against distemper and hepatitis. One week after admittance, all dogs developed diarrhea, to some extent bloody.

Fecal microscopy by the flotation method in a saturated sucrose solution was conducted on all dogs for coccidia and their oocysts. Each specimen was centrifuged and the findings are presented in Table 1.

Three days prior to anticoccidial treatment, all dogs were wormed with an appro-

TABLE 1. Fecal Examination and Severity of Infection Before Treatment

Group	Dog No.	Coccidia	Worms			
			Round	Hook	Tape	Whip
Furadex	1	++	++			
	2	++		+++		
	3	+++				+
	4	Few	+			
	5	+++				
Sulfaguanidine	6	+		+++		
	7	++		++		++
	8	+		+		+
	9	++				++++
	10	++		+++		
Control	11	+		+		
	12	++	++	++		
	13	+				++
	14	++	++			
	15	+++		++	++	

\+ 1 to 6 oocysts or ova per high power field
++ 7 to 15 oocysts or ova per high power field
+++ 16 to 29 oocysts or ova per high power field
++++ over 30 oocysts or ova per high power field

TABLE 2. Fecal Examination After One Week of Anticoccidial Treatment

Group	Total No. Dogs	Coccidia	Worms			
			Round	Hook	Tape	Whip
Furadex	5	All neg.	All neg.	1+	All neg.	2+
Sulfaguanidine	5	3+ & 1++	All neg.	3+	All neg.	2+ & 1++
Control	5	3+	All neg.	2+	All neg.	All neg.

TABLE 3. Fecal Examination After Two Weeks of Anticoccidial Treatment

Group	Total No. Dogs	Treatment	Coccidia	Worms			
				Round	Hook	Tape	Whip
Furadex	5	None	Neg.	Neg.	Neg.	Neg.	Neg.
Sulfaguanidine	5	2nd course	3+	Neg.	1+	—	—
Control	5	None	3+	Neg.	Neg.	Neg.	1+

priate anthelmintic, but this produced no improvement in the consistency or appearance of the stool. The dogs were divided into 3 groups of 5 each: 1 group was treated with 2 mg. of nitrofurazone per lb. body weight *b.i.d.*, a 2nd group was given 1 grain sulfaguanidine per. lb. body weight once daily, and a 3rd group served as the nonmedicated controls (Table 2). They all were treated for 1 week.

Results

The fecal examinations of these dogs are summarized in Table 2 after 1 week of treatment and in Table 3 after 2 weeks of treatment.

In the nitrofurazone-treated group, 2 animals continued to have diarrhea, which subsided spontaneously without further medication in 1 week. Four of the 5 sulfaguanidine-treated dogs also continued to show diarrhea and, therefore, a 2nd course of treatment with the drug had to be given to all 5 dogs. In the control group, 3 dogs continued to have diarrhea, and although no anticoccidial treatment was given, the 5 dogs had to be rewormed as before.

The 5 dogs originally treated with sulfaguanidine were then given 2 mg. of nitrofurazone per lb. body weight *b.i.d.* for 1 week, at which time fecal microscopy showed that all dogs were free of coccidia and stools were of normal appearance.

Summary

A comparative study to evaluate the efficacy of nitrofurazone and sulfaguanidine in canine coccidiosis was conducted. Two mg. of nitrofurazone per lb. body weight effectively controlled coccidiosis. Under the conditions of this study, treatment for 7 days with this preparation was superior to sulfaguanidine. Results with sulfaguanidine were identical to those occurring in nonmedicated controls.

REFERENCES

1. Harwood, P. D., Stunz, D. I., and Wolfgang, R., An Effective New Coccidiostatic. *Jour. Parasitol.*, suppl. 14, sec. 2, 33:4-15 (Dec.) 1947.

2. MacDonald, I., Rearing of Rabbits Free from Coccidial Infection of the Liver (Eimeria stiedae). *Jour. Anim. Technicians' Assn.*, London, 8:68-70 (Dec.) 1957.

3. Pellerdy, L., and Babos, A., Experimental Treatment of Intestinal Coccidiosis in Rabbits. *Acta Vet. Acad. Sc. Hung.*, 3:423-430, No. 4, 1953.

4. Deom, J., and Mortelmans, J., Essai Therapeutique de la Coccidiose du Porc par la Nitrofurazone. *Ann. Med. Vet.*, 98:82-86 (Mar.) 1954.

5. Tarlatzis. C., Panetsos, A., and Dragonas, P., Furacin in the Treatment of Ovine and Caprine Coccidiosis. *Jour Am. Vet. Med. Assn.*, 126:391-392 (May) 1955.

6. Tarlatzis, C., Panetsos, A., and Dragonas, P., Further Experiences with Furacin in Treatment of Ovine and Caprine Coccidiosis. *Jour. Am. Vet. Med. Assn.*, 131:474-475 (Nov. 15) 1957.

7. Sellier, R., Essais de Traitement de la Coccidiose Bovine par le Nitrofural. Thesis, Bosc Frères, Lyon, France, 1954.

8. Fisher, G. W., Oral Use of Furadex in Canine Diarrhea. *N. Am. Vet.*, 29:133-134 (Mar. 15) 1958.

9. Smith, J. M., and Edmonds, R. S., Use of Nitrofurazone in Canine Coccidiosis. *Mod. Vet. Pract.*, 40:31-32 (Oct. 1) 1959.

Clinical Report: Canine Brucellosis

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Brucellosis has been reported in the dog, but it is not common. Experimentally, it requires multiple inocula to establish inflammatory lesions in lymph nodes and nephritis. The dog cannot be readily infected by ingesting milk contaminated with Brucella abortus organisms. It is believed that ingestion of infected tissues is the most likely source of infection. This report of brucellosis in dogs by Drs. Fincher and Puckett supports these beliefs. Also, it indicates that dogs probably are mechanical vectors of this disease in rural areas.

In June of 1960, a client on a small farm called, requesting examination of a newborn premature calf that he believed to be abnormally weak. Further questioning disclosed that there had been others like it on his farm. Blood specimens were drawn from the dam and also from the family milk cow. Both were 3+ reactors for brucellosis. The entire herd was then tested. About 1/3 of the herd reacted positively to brucellosis antigen.

In October following the outbreak of brucellosis, 2 Dalmatian bitches from the same farm were presented to our clinic showing lassitude and a mild fever of 102.5 F. One had a vaginal discharge. The owner stated that one had aborted. He had seen the bitch eating the placenta from a cow which had aborted and was known from the blood test to be a brucellosis reactor. It was assumed that the other bitch was pregnant, as she had been bred to a proven sire. On this occasion, however, no pups were produced. Blood specimens from both dogs were sent to Raleigh to the government brucellosis testing laboratory. Their report confirmed our findings on the quick plate test. Both dogs were 3+ reactors to brucellosis.

Drs. S. E. Neal and B. F. Hoerlein, of the School of Veterinary Medicine, Auburn University, advised us of the therapeutic value of streptomycin and sulfamethazine or aureomycin and sulfamethazine for the treatment of such cases.

A 5-day treatment of aqueous penicillin/streptomycin suspension and sulfamethazine alone was given. Both dogs' general condition improved. They had a good appetite and were bright and alert. No bacteriological work was done, but when much later a 2nd blood specimen was sent to the Raleigh brucellosis laboratory, again the dogs were positive in all three dilutions.

Are dogs a reservoir for brucellosis and, therefore, a public health hazard? Do they frequently spread the disease to other cattle or people? Dogs are frequently observed licking the hands and face of people, especially children. This could be dangerous if the dog were shedding brucella organisms from the genito-urinary tract.

In the community where these dogs are, 3 farms now have reactor cattle. The reactors appeared on each farm at intervals of 6 months or longer after the first. Scavenger dogs certainly can be mechanical carriers of the disease by carrying improperly disposed placentas and aborted fetuses from farm to farm.

VM

Small Animal Clinic

Here each month are published ideas, suggestions and comments picked up by VM Reporters.

Unusual Hematoma Reveals Diagnostic Role of Exploratory Laparotomy

A 9-year-old mixed Cocker Spaniel female was presented to the clinic with a history of vomiting for the last 3 days. There was no evidence of diarrhea, no change in water drinking habits, and she still would eat at least part of her food. The dog was a house pet and was never out of the owner's yard. There was no history of injury.

Clinical examination showed a normal temperature, respiration, pulse, and a normal appearance to the eyes. Palpation of the abdomen revealed a circular mass about the size of a tennis ball in the region of the right kidney. An enema revealed nothing diagnostic. A radiograph showed a circular shadow, but nothing as to its character or cause.

An exploratory laparotomy was performed. The mass was brought to the surface as nearly as possible and found to be connected to the capsule of the right kidney by very extensive adhesions. The adhesions were broken down by careful blunt dissection and the mass removed intact.

There was no apparent arterial blood supply to the mass. The kidney had some petechiae on the surface, and the mass appeared to have partially obstructed the ureter. It had a tough fibrous wall about 1/8 inch thick surrounding a spongy mass interspersed with clotted blood and was diagnosed by a pathologist as a hematoma.

The dog made an uneventful recovery following surgery. Her appetite returned to normal the next day and no more vomiting occurred.

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Post-surgical Fluid Therapy

In an effort to intelligently combat shock, surgical blood loss may be calculated by weighing the sponges used during surgery and comparing their weight after surgery with the same number of dry sponges. Add the weight of blood in the drain bucket or on the table and increase this figure by 1/3 to adjust for the blood in the drapes and on the body.

If replacement is to be near normal,

the transfusion should be based on these calculations. When full surgical shock is imminent the patient has usually lost 30% of the normal blood volume. For example, the normal blood volume of the dog is 8% of the body weight. A 50 lb. dog would have a blood volume of nearly 3,000 cc. If 30% replacement were necessary, 900 cc. of blood would be required. This is in conflict with some published ideas in which it is suggested that 10 cc. of blood per lb. of body wt. be administered. This method is based on human studies and does not necessarily apply to the dog.

The signs and symptoms of shock may disappear before the calculated amount of blood is administered, but restoration of the normal blood volume will materially aid postoperative recovery. Gelatin extenders or even 5% glucose may be used, but animals that have lost 30% or more must have a blood transfusion.

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Digitalis Intoxication

Two teams of British investigators describe a complication of potassium depletion associated with digitalis therapy, atrial tachycardia with atrioventricular block.

Dr. Samuel Oram and his colleagues at King's College Hospital, London, report 11 cases in which digitalis is believed to have played the main part in causing atrial

Photo by J. Mosier, D.V.M., Kansas State University. Scarring of the nose, an aftermath of pyogenic dermatitis. This usually occurs in puppies at 6 to 8 weeks of age. Staph. and strep. organisms can be isolated from these cases, but a virus may be the primary infection. It is thought by some to be an allergic syndrome.

tachycardia with atrioventricular block; Dr. M. F. Oliver and his colleagues at Edinburgh report 18 cases.

Dr. Oram and colleagues draw attention to the need to suspect the presence of atrial tachycardia with A. V. block if the congestive heart failure in a patient receiving digitalis suddenly worsens, or reappears, without obvious cause. If careful inspection of the neck veins reveals a jugular a-wave faster than the apical rate, the condition is suggested.

To distinguish atrial flutter from atrial tachycardia with A. V. block, the clinician should be aware that pressure on the carotid sinus will increase atrioventricular block, while atrial tachycardia will be unaffected or revert to normal rhythm.

Treatment of the attack is by stopping digitalis and giving 2 gm. to 8 gm. of potassium chloride by mouth each day. Intravenous potassium is usually unnecessary, the majority of patients reverting to normal rhythm without it. For patients not treated with potassium, the prognosis is very bad. As a wise precaution, Dr. Oliver believes potassium supplements always should be given to patients who are receiving digitalis and diuretics.

Brit. Med. Jour. 2:1436 (Nov. 12), 1960

Nickel Sensitivity

Nickel dermatitis as a complication of routine intravenous infusions was noted in two patients treated within a three-month period in the Royal Victoria Infirmary, Newcastle Upon Tyne.

Dr. J. C. Stoddart, lately registrar of the Department of Anesthetics, suggests that the cause was sensitivity to the nickel in the infusion cannulae. As nickel sensitivity is relatively common, a proportion of the hitherto unexplained infusion reactions may be due to nickel cannulae. They may produce the immediate or delayed type of hypersensitivity, he pointed out.

In one patient an alarming anaphylactoid reaction occurred 45 minutes after a plasma infusion was set up. Blood, dextran and noradrenaline were given before her condition improved. A generalized urticarial rash with pruritus, that developed eight hours after the blood transfusion was stopped, persisted for five days.

This patient told the ward staff she was nickel-sensitive, but it was not appreciated that she had been in contact with nickel and the importance of this information was overlooked.

In the second patient the first symptom of a reaction did not occur until 18 hours after the first occasion (surgery was a two-step procedure) and 36 hours after the second occasion.

Analysis of the cannulae and metal gauze filter used in infusion sets in the British hospital showed that two types of cannulae had nickel-steel shafts and nickel-plated brass hubs; a third had a nickel-steel shaft with a plastic hub. The metal gauze filter contained 66% nickel and 34% copper.

Lancet 2:741, (Oct. 1), 1960.

Ointment Bandage

A new ointment that medicates and dries to form a plastic bandage has been developed by Dr. Joe E. Haberle, Assistant Professor of Pharmacy at the University of Tennessee College of Pharmacy, Memphis. He describes this new preparation as a kind of bandage in a tube.

Designed primarily for cuts and other superficial wounds, it is made of a combination of plastics in a washable, nongreasy base. The white cream dries in four to five minutes, leaving a tough, flexible plastic film firmly attached to the skin.

The main ingredient of this ointment is polyvinyl alcohol. Any number of disinfectants and antibiotics could be incorporated into the ointment. Research is continuing along that line. It appears that the ointment will release most medications with little or no difficulty.

Med. Tribune 1:4, (Oct. 10), 1960

Guest Editorial

Editorial Evaluation of Live Virus Vaccines

KARL MAYER, D.V.M.

The author is a former editor of the *North American Veterinarian*, and is presently Medical Editor, Pitman-Moore Company, Indianapolis, Indiana.

Recently Prier,[1] in an article in the *Journal of American Veterinary Medical Association*, ventured an editorial evaluation of live virus vaccines. A keynote of the article is that "Live virus vaccines are not the ultimate in virus disease prevention by prophylactic means." The main contentions appear to be that the potential dangers of modified live virus vaccines are not considered seriously enough; that new veterinary vaccines are released on the basis of insufficient evidence of need, efficacy and safety; and that regulations for the manufacture and control of live virus vaccines often are inadequate and laxly supervised. Among the remedies proposed is that regulatory officials should approve new vaccines or changes in process and testing methods only after the opinion of a qualified advisory committee has been considered; a committee consistiing " . . . of at least 8 nongovernmental and noncommercially employed scientists." The allegations call into question the integrity and competence of commercially and governmentally employed scientists, many of whom are members in good standing of the veterinary profession. The field under criticism is an important one and, if the allegations are valid, effective steps toward correction of abuses should be initiated immediately.

However, a critical examination suggests a questionable knowledge on the part of the author concerning important characteristics of certain live virus vaccines, an apparent lack of experience in the practice of disease prevention and, in general, a far from objective viewpoint. Arguments offered as evidence appear, on the whole, to be suppositions made on the basis of highly selected and often out-of-context references to the literature. Thus, the article is editorial in nature. For the sake of brevity, only some of the many issues of questionable validity will be considered in this frankly editorial reply. But an attempt will be made to answer a favorite question, "What is the evidence?," of the late and respected Dr. A. J. Carlson.

Prier states that, "Infectious bovine rhinotracheitis is recognized as an important disease of cattle in the United States," and that the current immunization procedure involves a tissue culture modified live virus that was introduced commercially relatively soon after the disease was first described, " . . . with a minimum of critical evaluation." Among the references he does not cite are reports[2,3,4] of controlled field tests by different groups of workers, involving many thousand head of cattle in several western states, reports which clearly demonstrate the efficacy of the vaccine. It seems possible that in this instance the judgment of regulatory officials may have been superior to that of Prier, who elsewhere asserts

that it is inconceivable that satisfactory information for the acceptance of a new vaccine could be obtained in less than several years. Since the disease is recognized as important, and the vaccine was quickly given wide and repeated use by veterinarians, one may wonder about the effect on feed lot cattle had the criterion of "several years" been applied to the vaccine. The evidence indicates that extensive time and the development of effective vaccines are not related functions.

From a paper[5] dealing with certain attributes of a particular, high rabbit passage, rabbit origin live modified hog cholera vaccine, the following statement is quoted by Prier as though it were applied by the authors to all modified hog cholera viruses: " . . . the vaccine virus combines the immunogenic properties of a living virus and the safety of a killed virus vaccine and is, in fact, nonvirulent." Then, without defining the alleged deficiencies, he asserts that "Supporting experimental evidence does not entirely justify such a statement."

He proposes that either canine distemper virus used as a measles vaccine in man (not an approved procedure) or measles virus used as a canine distemper vaccine (also not an approved procedure) may mutate in the unnatural host, with serious results upon retransmission to the original host. This idea might be described as a hypothesis in search of phenomena, and the identical theme is discussed with reference to the stability of modified viruses elsewhere in the paper. It is, of course, an interesting idea that perhaps should receive some consideration, but lack of concrete evidence in its favor following extensive studies and clinical use of many live virus vaccines suggests that it is not of overwhelming practical importance, particularly when applied indiscriminately.

The author states that, "The required level of live virus canine distemper vaccine for adequate immunization is generally accepted as a minimum of 1,000 chicken embryo infective doses." Fragmentary data on the virus content of 6 market samples involving 4 manufacturers are presented to show that 3 of the samples did not have a satisfactory titer, 2 of them well in advance of expiration date. In this instance, Prier ignores evidence from 2 other papers,[6,7] cited elsewhere by him, that tissue culture distemper vaccine in doses as small as 10 and even fewer egg infectious doses will immunize a dog. Unsatisfactory titers in commercial vaccines, of course, would be serious, but Prier presents no concrete evidence that the vaccine samples were ineffective, or that manufacturers and governmental officials omit continual stability studies or are unconcerned about improving existing methods. In truth, the opposite is the case.

Prier criticizes the fact that there is no requirement for sterility of egg virus live vaccines. It is well known that bacteriologic sterility of an egg live virus vaccine is not considered practical or necessary. Animal tests designed to insure the absence of pathogenic microorganisms are therefore a requirement for all such vaccines.

While more examples could be discussed, the foregoing should suffice to indicate the degree of error that may result from bias and lack of objectivity. Decisions on veterinary biologics must, of course, be based on scientific evidence. For intelligent decision, however, much practical knowledge and experience also are required, as well as a real desire to provide economic and practical tools for the control of disease. Eradication is another matter, and no one at this stage of knowledge is apt to propose that a vaccine by itself is capable of eradicating any disease. An article by Hejl[8] provides evidence that regulatory officials routinely consider points that Prier has raised.

Scientists in government and industry do consult and work freely with their colleagues in research institutions, and such liaison was responsible in large part for expediting the commercial availability of Salk poliomyelitis vaccine, for example. No claim has ever been made to my knowledge that the availability of this vaccine was solely a commercial achievement. But the fact that the willingness of manufacturers to risk a considerable gamble in its com-

mercial development was a key factor, cannot be denied.

That any medical technic (or preventive or therapeutic agent) is necessarily the ultimate that science may eventually achieve might well be doubted. However, in the practical treatment, prevention, and control of disease, those responsible must select the best applicable technics and products of established value and, whenever justifiable, conduct clinical trials of new developments that show promise of significant improvements.

Even well established biological agents tend to present special clinical problems, the solutions of which may not be imminent, nor are the problems necessarily relevant to the situation at hand. For example, the fact that vaccination against smallpox may cause undesirable complications should not deter its widest possible use. A complication that is not entirely preventable, postvaccination encephalitis, fortunately is relatively rare, at least currently. Its mortality, however, is high (30% to 50%). The threat of other complications, generalized vaccinia and pyogenic infections, can be minimized by the application of knowledge gained through experience, observation, and medical progress; nevertheless, these complications are still potentially dangerous.

The small percentage of reactions to vaccinia virus is especially slight, however, when compared to the benefits vaccination confers through the prevention of smallpox epidemics. Even in the face of an almost overwhelming lack of evidence, of course, other dangers of smallpox vaccination can be surmised if only the imagination is vigorously applied. Here is a relatively innocuous virus, vaccinia, that is constantly being disseminated into the uncontrolled environment of an artificially infected host. Can we be certain of its stability under such conditions? What if it should mutate in one of a million or so such transfers, and at some time become a new and uncontrollable scourge of the bovine, or even of man himself? In the absence of incontrovertible proof to the contrary, can we afford to risk continuing smallpox vaccinations?

This is, of course, speculation that at this date borders on the ridiculous with respect to smallpox vaccination. But it is not dissimilar from speculations about more recent viruses of modified character, even some that have had extensive clinical usage. Had such speculation been possible at Jenner's time, it might have supplied additional fuel for the abuse that was heaped on his idea, and delayed even longer a widespread acceptance of vaccination.

In the United States, commercial producers of biologicals and governmental regulatory officials play an essential part in veterinary and human medicine. Responsibility for the production and control, as well as the commercial development of new biologicals has fallen on them. As a group, it can be assumed from available evidence that the individuals in its rate generally high as regards conscience, a feeling of responsibility in their work, and in moral caliber. Much of the original research published by individual scientists in the group is of highly acceptable caliber, and much bears no direct relationship to any commercial advantage. Certainly a "shotgun" indictment of such groups is far from justified.

REFERENCES

1. Prier, J. F., Live Virus Immunizing Agents. *Jour. Am. Vet. Med. Assn.*, 137:577, 1960.
2. Kendrick, J. W., York, C. J., and McKercher, D. G., A Controlled Field Trial of a Vaccine for Infectious Bovine Rhinotracheitis. *Proc. 60th Ann. Mtg. U. S. Livestock Sanitary Assn.*, 155-158, 1956 (1957).
3. York, C. J., Schwarz, A. J., Zirbel, L. W., and Estela, L. A., Infectious Bovine Rhinotracheitis Vaccine. *Vet. Med.*, 53:522, 1958.
4. Brown. W. W., and Chow, T. L., Field Trials of Infectious Bovine Rhinotracheitis Vaccine. *Jour. Am. Vet. Med. Assn.*, 134:29, 1959.
5. Newberne, J. W., Johnston, R. V., Robinson, V. B., York, C. J., and Sanders, E. F., Recent Studies on the Properties of a Nonvirulent Living Hog Cholera Vaccine. *Vet Med.*, 54:41, 1959. Also in *Proc. 62nd Ann. Mtg. U. S. Livestock Sanitary Assn.*, 278-289, 1958 (1959).
6. York, C. J., Bittle, J. L., Burch, G. R., and Jones, D. E., An Effective Canine Distemper Tissue Culture Vaccine. *Vet. Med.*, 55:30, (April), 1960.
7. Sinha, S. K., Stewart, G., Marshall, V., Hass, H., and Hawksley, M., Tissue Culture Modified Canine Distemper Vaccine. *Vet. Med.*, 55:36, (April), 1960.
8. Hejl, J. M., A Practical Evaluation of Live Immunizing Agents. *Proc. 60th Ann. Mtg. U. S. Livestock Sanitary Assn.*, 47-52, 1956 (1957).

Methods to Differentiate and Estimate Worm Burdens in Cattle

Practitioners have a need for a method to estimate the worm burden in cattle. The method described in this paper groups the eggs of certain genera of cattle nematodes into 2 categories, other genera being readily differentiated. A method has been worked out to estimate the number of parasites present.

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Ova Identification

Identification of Eggs: While the number of parasite eggs present in a gm. of feces is easily determined, the kind is more difficult to ascertain. The eggs of some nematode parasites infecting bovines are distinctive and can be identified with relative ease. There are others which cannot be specifically identified.

It was possible to identify eggs of these genera: *Bunostomum, Trichuris, Nematodirus, Strongyloides,* and the eggs of the tapeworm, *Moniezia.* Genera of bovine nematodes *Haemonchus* and *Oesophagostomum* were not distinguishable from each other, so were grouped together. Likewise, the eggs of *Trichostrongylus, Ostertagia* and *Cooperia* were similar, so they were placed together in another group.

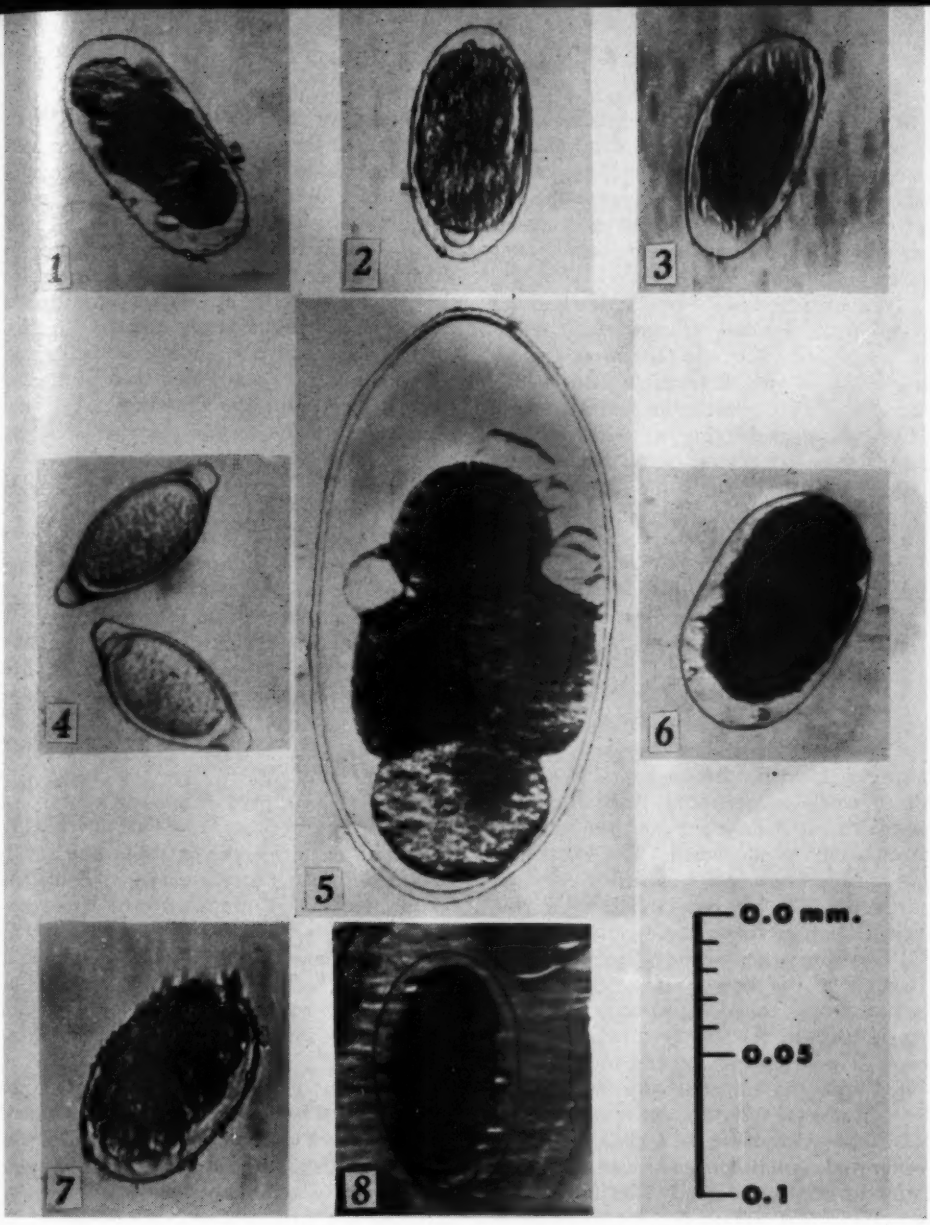
The similarities and differences of the various nematode eggs become more apparent after examining Figures 1-8. These eggs were removed from the terminal portion of the uterus of the corresponding female worms. This method of obtaining eggs gives inaccurate results with respect to the degree of segmentation. Segmentation of the figured ova is not necessarily the same as that occurring in eggs observed in fresh fecal samples.

The eggs of the *Cooperia-Ostertagia-Trichostrongylus* group are shown in Figures 1-3. These eggs show a tendency to have one (Fig. 3) or both sides (Figs. 1, 2) flattened in optical section. The embryo is usually in the morula stage of development when observed in fresh feces.

Eggs of *Trichuris* are characterized by bipolar plugs (Fig. 4). They are yellowish. The eggs of *Capillaria* may be confused with the eggs of *Trichuris,* but the former are smaller than those of *Trichuris.* Eggs of *Nematodirus* (Fig. 5) are large and can be distinguished easily from eggs of other genera. They appear usually in the 4 to 8 cell stages in fresh feces.

The eggs of *Bunostomum* are singular in appearance (Fig. 6). They are more rectangular in outline than are the eggs of other genera. The sides are almost parallel and the ends are somewhat blunted in optical section. When found in fresh feces, they have a fuzzy appearance due to foreign material adhering to the shell. They are usually found in the 8 cell stage and the cells are dark brown.

The eggs of *Haemonchus* and *Oesophagostomum* are similar in appearance (Figs. 7, 8). The sides of these eggs show more curvature than the eggs of the *Cooperia-Ostertagia-Trichostrongylus* group. *Haemonchus* eggs usually contain 16 to 32 cells, whereas eggs of *Oesophagostomum* contain



Photomicrographs of some Common Genera of Nematodes in Cattle

Fig. 1. Cooperia
Fig. 2. Osteragia
Fig. 3. Trichostrongylus
Fig. 4. Trichuris
Fig. 5. Nematodirus
Fig. 6. Bunostomum
Fig. 7. Haemonchus
Fig. 8. Oesophagostomum

4 to 16 cells when seen in fresh feces.

The eggs of *Strongyloides* are smaller than the eggs of the other genera of cattle parasites and are larvated when observed in fresh feces. They are usually encountered only in fecal samples from very young calves.

A comparison of the eggs of the 2 major groups of nematodes, *Haemonchus*—nodular worm and *Cooperia-Ostertagia-Trichostrongylus*, shows discernible differences. There are also similarities, which cause difficulty in identifying a particular egg under low power magnification. In such instances, the use of high dry magnification will reveal the differential characteristics more clearly. The accuracy of this method of grouping eggs was demonstrated[7] by making larval counts over an 8 month period on the same samples which were used for egg counts by the grouping method.

Species Identification

If species identification of nematodes present in cattle is necessary, then the fecal sample must be cultured and the resulting infective larvae identified. The identification of infective larvae[7,8] is difficult and requires practice. It was found[9] that the identification of these larvae can be simplified by using a nomogram (Fig. 9). Measurements of the larvae are needed to use the nomogram; therefore, an ocular micrometer is used in the eyepiece of the microscope. The ocular micrometer must be calibrated with the aid of a stage micrometer for each objective on a specific microscope. The stage micrometer is a slide on which is engraved a small millimeter scale, usually 2 mm. in length and subdivided into tenths and hundredths. Thus, the smallest unit is 0.01 mm. or 10 microns in length.[10]

In order to use the nomogram (Fig. 9) the following measurements of the infective larva are needed: The total length (anterior end to tip of sheath), the length of the tail sheath (anus to tip of sheath), and the extension of the sheath beyond the tail of the larva. If the results of measurements of the total length and the length of the tail sheath fall within the boundaries of 1 of the rectangles of the nomogram and not in an area where they overlap, the measurement of the extension of the tail sheath becomes only corroborative evidence. Where overlapping occurs among rectangles, the latter measurement can be the deciding factor in identification. Occasionally, a larva seems not to fit exactly the factors mentioned above, but careful study usually enables one to classify it properly. Infective larvae of *Cooperia* are easily identified by 2 oval bodies present at the anterior end of the esophagus.

Adult Worm Estimate

The problem of interpreting what an egg per gm. count means with respect to the probable number of adult worms present in an animal is difficult. Research on this problem, using the described method, has been done with sheep[5] but to our knowledge not with cattle nematodes.

Materials and Methods

The number of eggs per gm. of feces (EPG) was determined using a modified Lane flotation[6] technic. Ten gm. of feces were comminuted with water to 300 ml. The EPG count was based on a 30 ml. aliquot with 95% to 99% of the eggs being recovered on the first coverslips. The flotation medium was a saturated sodium nitrate solution.

Examination of the entire intestinal contents of a beef animal is not easily done. A random sample method would be better, but such a method depends upon a thorough mixing of the total intestinal contents. An agitator washing machine was tested as to its mixing efficiency. Known numbers of fine nylon threads of different colors, cut to the approximate length of bovine nematodes, were placed in 50 quarts of water in the washing machine. The machine was run 10 minutes. Then, with the machine running, samples were taken in wide-mouth mason fruit jars. The best method for sampling was to immerse the jar horizontally then tip it upright when removing it from

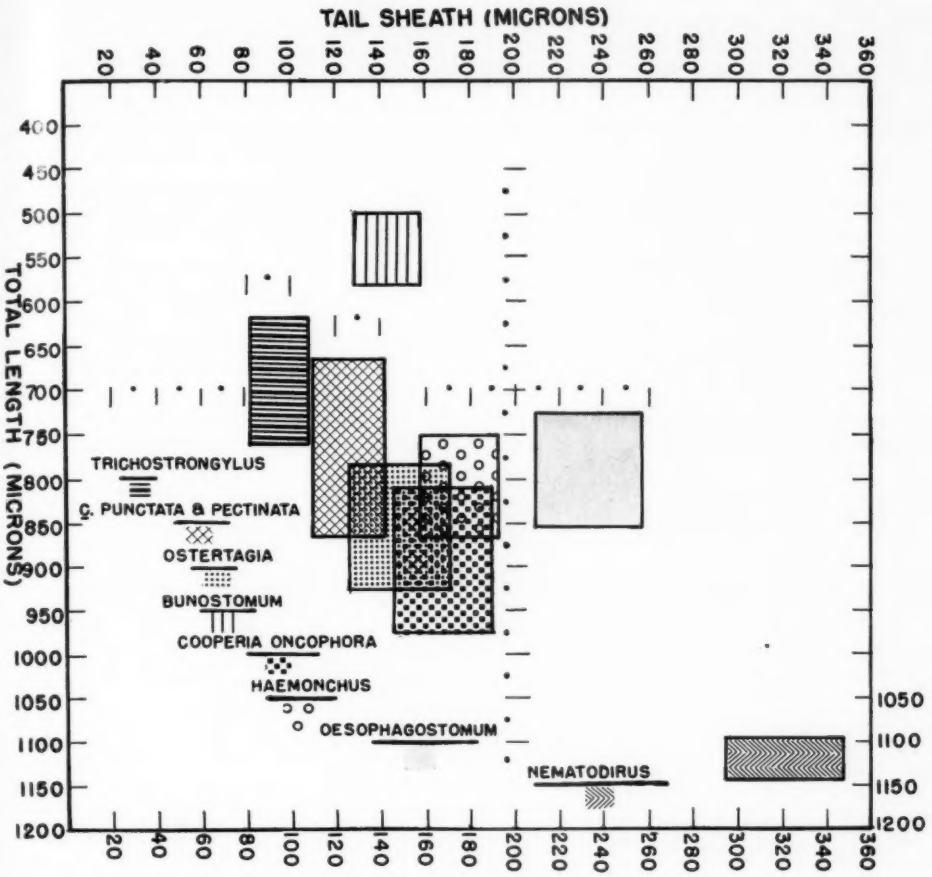


Fig. 9. Nomogram for infective larvae of common nematodes of cattle. Total length and length of tail sheath expressed as rectangles. Extension of sheath beyond tail of larva expressed as a single vertical line between generic name and legend. The values of the vertical axis (Tail Sheath) are to be used also for extension of sheath beyond tail of larva. Values taken from Keith, 1953.

the machine. Statistical analyses applied to the thread sampling data revealed that 20 one-quart samples of the original 50 quarts had to be taken to get a true sample of the population.

Based on the thread data and corroborative worm data, the formula for analyzing worm samples is $\frac{A^2K}{N\,P^2}$ = Number of 1-quart samples required. A is the level of confidence desired and would be equal to 2 if the 95% level is selected. K is the number of quart samples in the total quantity (K = 50 in above procedure), N equals the number of worms estimated in the entire quantity after examining the first quart sample, and P is the error expressed as a

decimal that can be tolerated in estimating N. For example, if after examining the first quart sample, N was estimated as 4,000 and an error of 10% could be tolerated, the number of samples required would be computed as follows: $\frac{2^2 \times 50}{4000 \times .1^2} = 5$ (number of 1-quart samples required). Thus, one would examine 5 one-quart samples to be reasonably certain that N was within 10% of its actual value. Obviously, the higher the number of parasites, the fewer the number of samples required. This formula has little value with small numbers of parasites.

Twenty spring Hereford calves were marked with neck chains at weaning time and allowed to range with a test herd being used to study ecological factors conditioning parasitism in Kansas beef cattle. Sixteen marked calves that lived were slaughtered as shown in Table 1. About 40 gm. of feces were removed from the rectum for EPG counts at slaughter time. The contents and mucosal scrapings from the entire digestive tract beginning with the abomasum of each calf were placed singly into the washing machine. Water was added until the machine contained 50 quarts of suspended material. The machine was run 10 minutes. Then, while the machine still ran, 20 one-quart samples were taken and formalin added for a preservative. Each quart was examined and the total number of worms present was recorded and identified.

TABLE 1. Differential Egg Counts and Total Parasites (Both Sexes) Recovered Post mortem

Calf	*Haemonchus* and *Oesophagostomum*		*Trichostrongylus*, *Cooperia* and *Ostertagia*		*Nematodirus*		*Trichuris*		*Bunostomum*		Total Eggs and Parasites		Date
No.	EPG*	WPM**	EPG	WPM	EPG	WPM	EPG	WPM	EPG	WPM	EPG	WPM	Slaughtered
1	110.0	180.0	4.5	84.0	—	8.0	—	2.5	—	—	114.5	274.5	
2	25.0	32.5	15.5	215.5	4.0	180.0	—	—	—	2.5	44.5	429.5	
6	3.5	3.0	2.0	47.5	—	11.0	—	—	1.0	—	6.5	61.5	November
9	14.5	8.0	4.5	12.5	0.5	2.5	—	—	—	—	19.5	23.0	
Av. Egg-Worm Ratios	1:1.46		1:13.57		1:44.78		—		—		1:4.26		
4	18.7	45.5	17.7	430.0	—	55.0	0.3	5.5	—	—	36.7	532.5	
8	17.5	5.5	8.0	335.0	—	90.0	3.5	2.5	—	—	29.0	438.0	
10	1.7	2.5	0.3	47.0	0.7	165.0	5.3	11.0	—	—	7.7	221.0	January
16	4.3	—	1.0	8.0	1.3	110.0	1.0	2.5	—	—	7.7	120.5	
Av. Egg-Worm Ratios	1:1.27		1:30.33		1:210.0		1:2.13		—		1:16.17		
7	22.7	32.5	9.3	425.0	4.3	500.0	0.3	2.5	—	3.0	36.7	963.0	
15	14.0	39.0	5.3	441.5	1.0	203.0	18.0	22.0	—	—	38.3	705.5	March
20	12.0	90.0	6.3	583.5	1.0	370.0	—	—	—	—	19.3	1043.5	
Av. Egg-Worm Ratios	1:3.32		1:69.38		1:170.32		1:1.34		—		1:30.88		
3	19.7	22.0	13.3	600.0	10.0	450.0	0.3	—	—	—	43.3	1072.0	
11	47.0	159.0	19.3	747.0	11.7	764.5	—	29.5	—	—	78.0	1700.0	
19	12.0	72.5	6.0	644.5	1.0	136.0	—	—	—	—	19.0	853.0	April
Av. Egg-Worm Ratios	1:3.22		1:51.59		1:59.49		—		—		1:25.84		
5	55.5	400.0	174.0	16437.5	0.3	12.5	—	6.0	—	—	229.8	16856.0	
13	14.5	167.0	102.5	11661.0	—	—	—	3.0	—	—	117.0	11831.0	August
Av. Egg-Worm Ratios	1:8.10		1:101.62		1:41.67		—		—		1:82.72		

* EPG, eggs per gram
**WPM, worms post-mortem

Egg-Worm Ratios: Egg counts have been used as a measure of the number of parasites infecting an animal. Usually, egg counts have been interpreted as the more eggs present, the more worms present.

The present study was an attempt to estimate the number of parasites represented by a particular EPG count in young bovines. Because of the large variations inherent in EPG counts,[11,12] it is apparent that large numbers of animals should be used to obtain exact ratios. The data in Table 1 represent a best estimate of egg-worm ratios for the few animals used.

The data showed that the egg-worm ratios are not the same for all genera of nematodes. Similar results have been reported for ovine nematodes.[8] There was a tendency for the number of worms represented by one egg to increase as the animals matured. Three factors could affect this increase: a decrease in egg production due to crowding,[5,13,14] fecal dilution,[15] or the quantity of roughage fed.[15] Caution must be used when relating EPG counts to worm burden. The practitioner should consider the age and diet of the animal and base his worm burden estimate on differential egg counts rather than on the usual and more easily done total egg counts. The use of the direct smear technic for evaluating the degree of infection, by the number of eggs in a given field of magnification, is of value only in making a definitive diagnosis of parasitism.

Summary

Photographs of nematode eggs of young beef cattle are shown, and a method to differentiate the ova of various genera of cattle nematodes is discussed. A nomogram is given to facilitate the identification of infective larvae of bovine nematodes. Egg-worm ratio data are given and factors conditioning the estimation of worm burden are discussed.

Contribution No. 300, Department of Zoology, Kansas State University, Manhattan and Zoology Series No. 336.

Acknowledgment

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This report is a portion of a dissertation presented by L. W. Dewhirst in partial fulfillment of the requirements for the degree Doctor of Philosophy in Parasitology at Kansas State University of Agriculture and Applied Science, Manhattan. Dr. Dewhirst is assistant professor of animal pathology, Department of Animal Pathology, and assistant animal pathologist, Agricultural Experiment Station, University of Arizona, Tucson.

REFERENCES

1. Shorb, D. S., Differentiation of Eggs of Various Genera of Nematodes Parasitic in Domestic Ruminants in the United States. *U. S. Dept. Agr. Tech. Bul.*, 694, 9 pp., 1939.

2. Kates, K. C. and Shorb, D. A., Identification of Eggs of Nematodes Parasitic in Domestic Sheep. *Am. Jour. Vet. Res.*, 9:54-60, 1943.

3. Porter, D. A., Simms, B. T., and Cauthen, G. E., Field Tests with Phenothiazine as an Anthelmintic in Cattle. *Jour. Am. Vet. Med. Assn.*, 119:272-278, 1941.

4. Krug, E. S. and Mayhew, R. L., Studies on Bovine Gastro-Intestinal Parasites. XIII. Species Diagnosis of Nematode Infections by Egg Characteristics. *Trans. Am. Micro. Soc.*, 68:234-239, 1949.

5. Kates, K. C., Diagnosis of Gastrointestinal Nematode Parasitism of Sheep by Differential Egg Counts. *Proc. Helm. Soc. Wash.*, 14:44-53, 1947.

6. Lane, C., The Mass Diagnosis of Hookworm Infection. *Am. Jour. Hyg.*, 8:1-148, 1928.

7. Hansen, M. F. and Shivnani, G. A., Comparative Morphology of Infective Nematode Larvae of Kansas Beef Cattle and Its Use in Estimating Incidence of Nematodiasis in Cattle. *Trans. Am. Micro. Soc.*, 75:91-102, 1956.

8. Keith, R. K., The Differentiation of the Infective Larvae of Some Common Nematode Parasites of Cattle. *Aust. Jour. Zool.*, 1:223-235, 1953.

9. Dewhirst, L. W., Longevity of Infective Larvae and Quantitative Diagnosis of Bovine Nematodiasis. *Prog. Rept. West. Reg. Project W-35*, 1960.

10. Manter, H. W., A Laboratory Manual in Animal Parasitology. Burgess Publishing Co., Minneapolis, Minn., Copyright 1935.

11. Spedding, C. R. W., Variation in the Egg Content of Sheep Faeces Within One Day. *Jour. Helm.*, 26:71-86, 1952.

12. Spedding, C. R. W. and Brown, T. H., The "Spring Rise" in the Nematode Egg-Count of Sheep. *Jour. Helm.*, 29:171-178, 1956.

13. Andrews, J. S., Note on the Egg Producing Capacity of *Cooperia curticei*, a Nematode Parasitic in Sheep. *Jour. Parasitol.*, 22:222-223, 1936.

14. Gordon, H. McL., Differential Diagnosis of the Larvae of *Ostertagia* spp. and *Trichostrongylus* spp. of Sheep. *Aust. Vet. Jour.*, 9:223-227, 1933.

15. Kelley, G. W., The Effect of Roughage on the Number of Eggs of *Haemonchus contortus* Per Gram of Feces from Experimentally Infected Calves. *Jour. Am. Vet. Med. Assn.*, 127:449-450, 1955.

Medical Interchange

Notes and abstracts screened from the medical literature for their special interest to veterinarians by Lynn Stratton Morris.

Acidified Milk vs. *E. coli*

Feeding of acidified milk to newborns and infants at the Creche St. Vincent de Paul, Quebec, lowered the incidence of intestinal infection due to *E. coli* and reduced the number of common acute infections (otitis, pharyngitis, pneumonia, etc.).

Dr. Antoine LaRue, hospital pediatrician, conducted controlled studies in 3 dormitories. Ordinary pasteurized milk was fed to infants in 2 dormitories and an acidified milk was given to the third. At the end of 3 months, 16 of the 24 fed pasteurized milk had stools of gastroenteritis as well as symptoms of infection, whereas the other 12 who were fed acidified milk remained in perfect health.

The prophylactic properties of the acidified milk formula in the presence of coliform infections then were tested. This type of feeding was used on chronic carriers of *E. coli* 0127B8 to determine whether this feeding technic could, by itself, reduce or destroy the pathogens in the intestinal tract. At the end of the 1st week all the infants, with the exception of those who were persistent carriers, were shown to have normal stools; this result was due entirely to the formula. None of the children received an antibiotic.

The study was extended to include all the newborns during their first 3 months. Identical results were obtained, a lowering of the incidence of intestinal infection and very few common acute infections.

These results also had a favorable effect on the financial status of the institution. Before the experiment, the monthly cost of antibiotic therapy varied for 4 months from a low of $388 to a high of $684. For the 9 months' period after the feeding of acidified milk was adopted, costs ranged from a low of $79 to a high of $280.

[Acidified milk (Pelargon) was made available by Nestlé of Canada.]

Canad. Med. Assn. Jour. 83:1002, (Nov. 5), 1960

Vitamin C & Cold

The lower the temperature to which an animal is exposed, the more vitamin C it requires, Dr. Louis-Paul Dugal, University of Ottawa, reported at a recent conference sponsored by the New York Academy of Sciences.

Adaptation to cold in both rats and guinea pigs is accompanied by increased concentrations of vitamin C in liver, kidneys, and adrenals and testes; urinary excretion is initially increased in both species but drops below room-temperature levels in guinea pigs within a few days. Failure

to acclimate is accompanied by a decrease in ascorbic acid content of these organs in both species.

Exposure to extreme cold causes frostbite in 30 to 35% of monkeys, according to Dr. Dugal. When a group of these animals was given 325 mg. of vitamin C daily, only one instance of frostbite occurred.

Med. Tribune 1:16, (Oct. 31), 1960.

Antibiotic Sensitivity

High penicillin resistance to *Staph. aureus* isolated from the noses of veterinary surgeons was found in a British study reported by H. Williams Smith and W. E. Crabb of the Animal Health Trust, Farm Livestock Research Centre, Stock, Essex.

The physicians found that 88% of the *Staph. aureus* strains isolated from 200 veterinarians were penicillin resistant. The corresponding figure for a control study in 200 farmers was 21%.

The proportion of strains resistant to tetracyclines, streptomycin or chloramphenicol was also higher in the veterinary surgeons (15%) than in the farmers (3%).

The resistant strains isolated in the study had characteristics resembling human rather than animal strains; therefore, the investigators believe it unlikely that the veterinarians acquired their penicillin-resistant strains from animal patients receiving penicillin.

Rather, they attribute the high percentage of resistant strains to the pencillin in their environment. Veterinary surgeons handle penicillin frequently in powder, liquid, and ointment, and the conditions of general veterinary practice are such that there is much greater opportunity for contamination with these preparations than there is in a human hospital. In conclusion they urge veterinarians to take more stringent precautions when handling antibiotics during the treatment of animals.

The Lancet, 2:515 (Sept. 3), 1960.

Antihistaminic Substance Isolated

British medical and veterinary scientists are cooperating to isolate, identify and produce a substance that has proved more powerfully antihistaminic and anti-inflammatory than any so far discovered. This substance, an extract of eosinophil leukocytes, appears to provide an entirely new approach to the treatment of asthma, hay fever and skin disorders in human beings.

Research into the deaths of thoroughbred horses, especially foals, led to the discovery of a substance in the leukocytes of the horse that played an active part in the control of histamine. Preliminary studies were conducted by Dr. W. R. Wooldridge, scientific director, Equine Research Station Health Trust, Newmarket, England, and his colleagues.

Earlier research work has shown that the effects of excess production of histamine in the body, the causative factor of many allergic conditions in humans and in animals, were automatically reduced in the presence of eosinophils. This suggested that injections of eosinophils might be used to combat histamine, provided that means could be found to separate live cells from the blood stream. After more than a year of work, the Equine Research Station developed a technic by which eosinophils, alive and normal in all respects, could be recovered from the blood in a high degree of purity. It is now possible to make an extract of eosinophil leukocytes containing this powerful substance.

The new approach is so promising that the British Medical Research Council and the Medical Research Development Council are cooperating in its further development.

Sci. News Letter 78:357, (Dec. 3), 1960

Brucellosis of Bone

Brucellosis of the bones and joints appears to be primarily a disease affecting farmers and other persons who come in contact with meat or milk from infected herds.

This is the conclusion of a Mayo Clinic team, based on a study of 36 patients with this manifestation of the disease. Twenty-nine patients were farmers and the others were engaged in occupations related to animal husbandry.

In 22 patients the diagnosis was based on actual culture of brucellar organisms and in 14 it was based on serologic evidence alone. *Brucella suis* and *Brucella abortus* were the strains most commonly isolated from skeletal lesions.

The presence of any inflammatory disease of the bones, joints or bursae should alert the physician to the possibility of brucellosis, particularly if the patient is a farmer or meat handler. Dr. Patrick J. Kelley and associates emphasized that perhaps in no other orthopedic infection is a careful occupational history so important.

For such patients aggressive surgical treatment usually is indicated. Patients with brucellar spondylitis are the exception, for this form of the disease usually responds to rest, the use of braces or casts and combined tetracycline-streptomycin therapy. Surgical intervention rarely is required.

Joints and bursae respond well to excision of the synovial tissue and therapy with combinations of antibiotics. Brucellar osteomyelitis is the most difficult of all the lesions to treat successfully. In their study, cultures usually became negative for Brucella organisms after antibacterial therapy, but invasion of the bone by secondary invaders such as staphylococci presented a difficult problem.

For treatment of brucellosis of the bones and joints, the Mayo Clinic orthopedists are currently using 500 to 750 mg. of tetracycline orally every six hours and 0.5 gm. of streptomycin injected intramuscularly twice daily for four weeks. Streptomycin or dihydrostreptomycin rarely cause damage to the vestibular or auditory function of the eighth cranial nerve at that dosage.

Jour. Am. Med. Assn.
174:347, (Sept. 24), 1960.

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Abortions vs. Climate

Spontaneous abortions appear to increase in proportion to sudden changes in the average day-to-day temperature, two Omaha obstetricians report.

To determine the possibility of a seasonal incidence of spontaneous abortions, Drs. Riley Kovar and Richert J. Taylor of the Department of Obstetrics and Gynecology, Creighton University, investigated a series of 1,141 patients for the years 1954-1958.

Since a poll of many experienced clinicians had disclosed the general impression that spontaneous abortions seem to occur in groups, a detailed statistical analysis of meteorologic factors, including temperature, was used to determine if sudden changes in these phenomena exerted a definite influence in the precipitation of hemorrhage and the initiation of uterine cramps by acting on the circulation or through some form of stress. Since conclusive evidence of this was lacking, a specific appraisal of 411 cases of spontaneous abortion occurring in 1958 at St. Joseph's and St. Catherine's Hospital was carefully made.

A casual sampling of changes in humidity, barometric pressure, percentage of sunshine and precipitation showed no significant evidence of correlation with the occurrence of spontaneous abortion.

The authors did find, however, that 40% of the 411 cases occurred on 13% of the days, supporting the clinical impression that spontaneous abortions appear in groups.

These days of concentration occurred during January, April, September and December, when the number of spontaneous abortions increased in proportion to sudden changes in temperature. The abortions occurred on the days of most marked temperature change. For example, on three January days, when the average daily temperature varied a total of 55 degrees, there were 15 abortions.

Obst. & Gynec. 16:350, (September), 1960.

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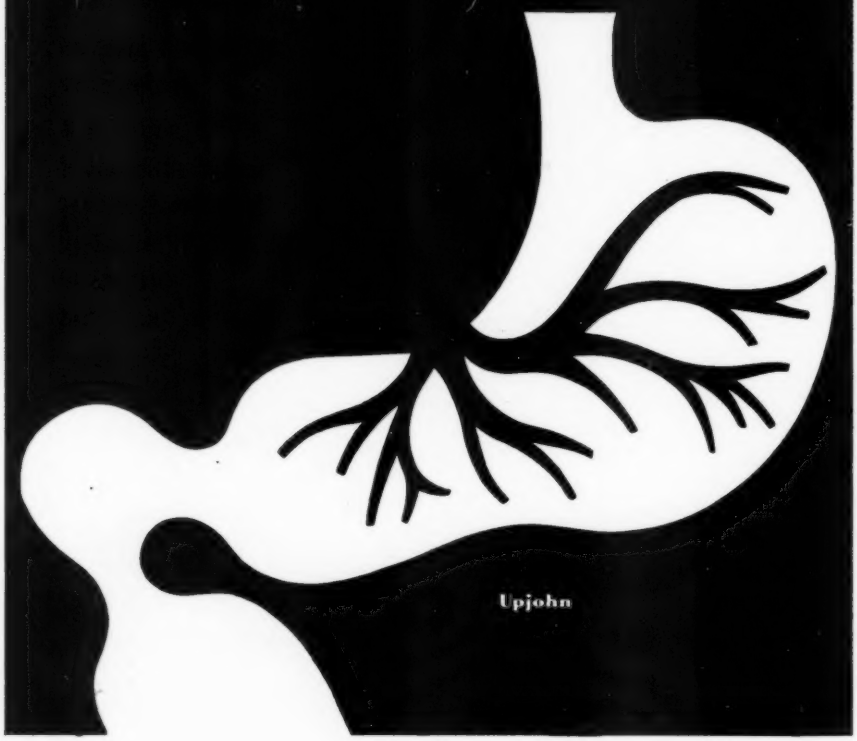

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